IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of	: THOMAS R. GOECKE	Examiner	: NASSER AHMAD
Application No.	: 10/674,108	Group Art	: 1772
Filing Date	: SEPTEMBER 29, 2003	Docket No.	: 29006-2 (new)
Confirmation No.	: 2438		
Title	: ADHESIVE TAPE		

Mail Stop Appeal Brief - Patents
Board of Patent Appeals and Interferences
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF

Dear Sir or Madam:

The following Appeal Brief is submitted pursuant to the Notice of Appeal filed January 17, 2007 in the above-identified application. The Appeal Brief is filed on the first business day after the two-month filing date of the Notice of Appeal and, therefore, is timely filed. This Appeal Brief is accompanied by the fee set forth in 37 C.F.R. § 41.20(b)(2), as stated in the accompanying Fee Transmittal Form.

TABLE OF CONTENTS

TABLE OF AUTHORITIES

Cases

Statute

Other Authorities

I. REAL PARTY IN INTEREST

Shieldmark, Inc., Assignee of the present application is the real party in interest.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

III. STATUS OF CLAIMS

Claims 1-6, and 9-10 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 2,559,990 to Oace (hereafter "Oace") in view of U.S. Patent No. 6,668,504 to Hughart (hereafter "Hughart"). Claims 7, 10 and 11 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Oace, in view of Hughart, U.S. Patent No. 6,461,715 to Guenther (hereafter "Guenther") and U.S. Patent No. 5,839,977 to Maurer (hereafter "Maurer"). Claim 12 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Oace in view of Guenther. Claim 8 has been cancelled. Claims 1-7 and 9-12 remain pending and are on appeal (see Section VIII, Claims Appendix).

IV. STATUS OF AMENDMENTS

No amendments have been filed subsequent to the non-final Office Action, mailed October 19, 2006 (see Section IX, Evidence Appendix, Tab A "October 19, 2006 Office Action").

V. SUMMARY OF CLAIMED SUBJECT MATTER

The claimed subject matter includes an adhesive tape having a polymer layer with a Shore A Hardness of between about 92 and 100 and a substantially uniform thickness of between about 0.020" to 0.065." A layer of adhesive is attached to the polymer layer. See page 2, lines.

9-22; page 3, lines. 22-24; page 4, lines.1-2; Fig.1. Another aspect of the claimed subject matter includes an adhesive tape of between 65 and 69 millimeters thick and having a layer of double-sided pressure sensitive adhesive in direct contact with the polymer layer. See page 2, line 2 and 20-22; page 5, lines 33-34. In another aspect of the claimed subject matter, the adhesive tape for has a peel adhesion greater than 2.0 lb/in width. See page 4, line 4- page 6, line 23.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

A. Whether Claims 1-6, and 9-10 are unpatentable under 35 U.S.C. § 103(a) as being obvious over Oace in view Hughart.

B. Whether Claims 7, 10 and 11 are unpatentable under 35 U.S.C. § 103(a) as being obvious over Oace, in view of Hughart, Guenther, and Maurer.

C. Whether Claim 12 is unpatentable under 35 U.S.C. § 103(a) as being obvious over Oace in view of Guenther.

VII. ARGUMENT

A. Introduction

The Applicant submits this Appeal Brief in support of its second Appeal from the Examiner in this matter. In the first appeal, a pre-appeal panel reversed the Office's rejections based on the Applicant's Pre-Appeal Brief Request For Review (see, Section IX, Evidence Appendix, Tab B, "Pre-Appeal Brief"). The application was returned to the Examiner and subsequently again rejected based in part on the same references deemed by the panel as insufficient to sustain a rejection. Far from incorporating more relevant art, the Office has cited new references directed to subject matter even further from the claims than before, such as a reference directed toward sound-deadening wall board.

B. The Cited Art

Two of the references cited in the Office's action, Guenther and Maurer, served as the basis for the Office Action first reviewed and found lacking by the pre-appeal panel. Guenther discloses closure tape for disposable diapers including a non-elastic backing provided with incisions overlaying an elastic sheet to permit adjustment. (See, Section IX, Evidence Appendix, Tab C, Guenther, Abstract). Maurer discloses a stepped tape configuration for hockey sticks where the first step has a thickness of 0.008 inches, the second has a thickness of 0.028 inches, and the third step has a thickness of 0.048 inches. (See, Section IX, Evidence Appendix, Tab D, Maurer at 12:66-67). However, as explained below, the Office likely mistakenly cited Maurer in the October 19, 2006 Office Action and, perhaps instead intended to cite to other references. Nevertheless, the Applicant has addressed the Maurer reference below.

The two new references cited by the Office in the October 19, 2006 Office Action, Hughart and Oace, are neither analogous to the present application, nor do they contain the limitations missing from Guenther and Maurer. Hughart discloses a sound-deadened wall including a spacer mechanically connected between wooden studs and wall panels. (See, Section IX, Evidence Appendix, Tab E, Hughart, Abstract). Oace discloses an electrically insulating tape having elastic properties which render it highly effective for wrapping wire and cable splices. The elasticity of the tape disclosed in Oace is an important feature making snug wrappings possible. (See, Section IX, Evidence Appendix, Tab F, Oace, 3:56 bridging 4:3).

C. Discussion

The rejections in the Office's October 19, 2006 Office Action are improper under the both the patent statutes and governing patent rules. The patent statutes require the claims to be considered as a whole:

> A patent may not be obtained . . . if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

35 U.S.C. § 103 (a) (2000)(emphasis added.)

The Federal Circuit has discussed the importance that the claimed subject matter be considered as a whole, not broken into component parts:

> Inventions typically are new combinations of existing principles or features. The 'as a whole' instruction in title 35 prevents evaluation of the invention part by part. Without this important requirement, an obviousness assessment might break an invention into its component parts (A + B + C), then find a prior art reference containing A, another containing B, and another containing C, and on that basis alone declare the invention obvious. This form of hindsight reasoning, using the invention as a roadmap to find its prior art components, would discount the value of combining various existing features or principles in a new way to achieve a new result – often the very definition of invention.

Ruiz v. A.B. Chance Co., 357 F.3d 1270 (2004).

Additionally, the Office's rejections are improper under the patent rules for a variety of reasons. For example, for the Office to rely on a reference under 35 U.S.C. § 103, it must be analogous prior art. (MPEP § 2141.01(a) citing In re Oetiker, 977 F.2d 1443, 1446, 24 USPQ2d 1443, 1445 (Fed. Cir. 1992)). If the references are analogous, the references still must teach all of the claim limitations in order to properly form a basis for a rejection. (MPEP § 2143.03 citing In re Royka, 490 F2d 981, 180 U.S.P.Q. 580 (CCPA 1974)). Even then, a proposed modification must leave the reference satisfactory for its intended purpose. Otherwise, if the reference is

rendered usable, but unsatisfactory, then there is no suggestion or motivation to make the proposed modification. (MPEP § 2143.01 citing In re Gordon, 733 F.3d 900, 221 USPQ 1125 (Fed. Cir. 1984)).

1. Claims 1-6 and 9-10 are not proper combinations of Oace and Hughart

Claims 1-6 and 9-10 stand rejected under 35 U.S.C. § 103(a) as being unpatentably obvious over Oace in view of Hughart.

As a threshold issue, Oace and Hughart are simply non-analogous art. Oace relates to a tape for electrical insulation and protection of electrical conductors, while Hughart relates to spacers separating wall boards from underlying wooden studs. The Office Action lacks any explanation why wall board sound deadening arts would have logically commended itself to an inventor's attention in considering an adhesive tape problem. Because there is no suggestion, explicit or implicit, that a wall board system should be considered as reasonably pertinent to the particular problem with which the inventor was concerned, the rejection of claims 1-6 and 9-10 is improper and should be withdrawn.

Further, even if Oace and Hughart were analogous, the Office has failed to consider the subject matter as a whole and has instead fallen victim to hindsight reasoning cautioned against by the Ruiz court. Specifically, as a whole, Hughart does not fairly suggest a polymer layer having the Shore A Hardness limitation missing from Oace. Pending claims 1-7 and 9-10 call for an adhesive tape having a thickness between 0.020 and 0.065 inches and comprising a polymer layer having a Shore A Hardness of between about 92-100. In rejecting these claims, the Office cited to a polymer wall board device 36 in the Hughart reference as disclosing an

"adhesive tape" having a particular Shore A Hardness. However, reference number 36 of Hughart is not an adhesive tape but instead a "spacer" that is adapted to provide air gaps between the studs and the wall panel. As seen in the figures, these gaps appear to be about the thickness of the wall board. The Office did not attempt to explain how or why the apparently 0.5 inch spacer in Hughart could be reduced by an order of magnitude to meet the 0.020 and 0.065 inch range as claimed. Thus, Hughart fails to cure the admitted deficiencies in Oace, and the combination of Oace and Hughart does not render claims 1-7 and 9-10 obvious.

Further, the Office rejected claim 2 as unpatentable over Oace in view of Hughart, citing to Hughart's disclosure of reference number 30 as a disclosure of the substrate of the present claim 2. Applicant's claim 2 is directed to an adhesive tape comprising a substrate attached to the outermost side of the layer of adhesive. Reference number 30 in Hughart is not such a substrate but rather a "wall panel" having an "expansive surface" to which supporting structures are attached. (Hughart, 2:18-32). Therefore, the deficiencies of Oace are not cured by Hughart to render claim 2 unpatentable.

With regard to claim 3, the Office concluded, without support, that the polymer layer having a textured surface is "inherent of the backing to be able to bond to the adhesive layer," therefore rendering the claim unpatentable over Oace in view of Hughart (October 19, 2006 Office Action, p.3). There is no teaching of a "textured surface" in either Oace or Hughart, nor did the Office offer any support for the conclusory statement. Therefore, the rejection is improper and should be overturned.

The Office rejected claims 5 and 6 based on citations to Oace purporting to disclose the polymer layer having a coloring pigment of claim 5, and the polymer layer comprising a clear polyvinyl chloride of claim 6. However, because Oace fails to teach or disclose a polymer layer having a Shore A Hardness of between about 92 and 100, and Hughart does not cure those deficiencies, claims 5 and 6 are patentable over a combination of Oace and Hughart.

Regarding claim 9, the Office rejected the claim as an obvious optimization of the purported "backing" disclosed in Hughart. However, for the reasons given above, Hughart is not properly combined with Oace to render claim 9 obvious. Further, Hughart does not disclose the polymer layer of claim 9 but rather a "spacer" for use in sound-deadening walls. Therefore, Hughart, alone or in combination with Oace, does not render claim 9 unpatentably obvious.

As seen, the combination of Oace and Hughart is merely the result of a hindsight rationale identifying discrete, unrelated components from various references to declare the claims obvious. As such, it cannot be supported and the rejections should be reversed.

2. Claim 12 is not a proper combination of Oace in view of Guenther

In the rejection of claim 12 as unpatentably obvious over Oace in view of Guenther, the Office has again failed to consider the subject matter as a whole and has instead applied hindsight reasoning using the invention as a roadmap to find its disparate elements in the prior art.

For example, Guenther discloses a non-elastic backing layer (Guenther, 6:49-52) rendered stretchable by one or more incisions (or slits) 14 (Guenther, 11:29-35). On the other hand, Oace is replete with descriptions noting the desirability of elasticity, even noting the

"elasticity of the tape is a valuable feature" of the invention (See, e.g., Oace, 3:69-75). As a second example, Oace is intended to serve as an electrical insulator. The incisions or slits in Guenther's layer would seriously undermine any resulting tape's insulating properties. These inconsistencies highlight the incompatibility of the Guenther and Oace references and the futility of the suggested combination. Thus, because the combination suggested would improperly render the individual references unsuitable for their intended purposes, the rejection is overcome.

Finally, the Office cited Guenther's teaching of a "polymer layer (11) having a thickness of 50-500 microns" as meeting the claimed polymer layer having thickness between 0.020" and 0.065" in claim 12. In addition to the deficiencies noted above, readily available conversion tables show that the 50-500 micron range disclosed by Guenther is less than and does not include the claimed range of between 0.020" and 0.065" of claim 12.[1] Therefore, the references fail to teach each and every element of claim 12.

3. Claims 7, 10, and 11 are not an obvious combination of Oace in view of Hughart and Guenther

The Office has rejected claims 7, 10, and 11 under 35 U.S.C. § 103(a) as being unpatentable over Oace in view of Hughart and Guenther.

Claims 7, 10, and 11 are directed to an adhesive tape comprising a polymer layer with a Shore A Hardness of between about 92 to 100. As discussed above in regard to the Office's rejection of claims 1-9 and 10-11, Hughart is not properly combined with Oace. For the same reasons, Hughart is not properly combined with Guenther to form the basis of a rejection under 35 U.S.C. § 103. Further, even if Hughart were properly combined with Oace and Guenther, it

[1] 500 microns = 0.019685 inches.

fails to disclose a polymer layer of an adhesive tape, but rather discloses a "spacer" that is "adapted to define air gaps between the studs and the wall panel" of the sound-deadening walls taught by Hughart. Finally, the Office refers to "the invention of Maurer," as rendering the claims unpatentable when combined with Guenther. Presumably, the Office intended to cite to either or both of Oace or Hughart, and not Maurer (presumably U.S. Patent No. 5,839,977, issued to Maurer) since Maurer is not mentioned elsewhere in the October 19, 2006 Office Action and is not discussed in any detail. However, even if the Examiner's intent was to combine Maurer with Guenther, the combination of the two would not render the claims unpatentable as the Examiner has acknowledged that Maurer fails to teach an adhesive tape having thickness of "between 0.020 and 0.065 inches...." (October 18, 2005 Office Action at p.3). Instead, Maurer discloses a stepped tape configuration where the first step has a thickness of 0.008 inches, the second has a thickness of 0.028 inches, and the third step has a thickness of 0.048 inches. (Maurer at 12:66-67). This does not meet the limitations of claims 7 and 10 requiring a "substantially uniform thickness between 0.020" to 0.065", nor does it meet the requirement of claim 11 that the adhesive tape have an average thickness of between 65 millimeters and 69 millimeters. Therefore, no combination of Oace, Hughart, Guenther, or Maurer render claims 7, 10, and 11 unpatentable.

D. Conclusion

The Appellant submits that the pending claims are allowable and urges allowance of the claims at an early date.

The Commissioner is hereby authorized to charge any additional fees, or credit any overpayment to Deposit Account No. 02-2051, referencing Attorney Docket No. 29006-2.

Respectfully submitted

Dated: 19 MAR 2007

By: _____

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VIII. CLAIMS APPENDIX

1. (previously presented) An adhesive tape comprising:

a polymer layer having a Shore A Hardness of between about 92 and 100 and a substantially uniform thickness of between about 0.020" to 0.065"; and

a layer of adhesive attached to said polymer layer.

2. (original) The adhesive tape of claim 1, further comprising a substrate attached to an outermost side of said layer of adhesive.

3. (original) The adhesive tape claim of claim 1, wherein said polymer layer includes a textured surface.

4. (original) The adhesive tape of claim 1, wherein said polymer layer is comprised of a polyvinyl chloride.

5. (original) The adhesive tape of claim 1, wherein said polymer layer includes coloring pigment.

6. (original) The adhesive tape claim of claim 4, wherein said polyvinyl chloride comprises a clear polymer.

7. (previously presented) The adhesive tape claim of claim 1, wherein said adhesive comprises a rubberized double-sided tape.

8. (cancelled)

9. (previously presented) The adhesive tape claim of claim 1, wherein said polymer layer has a Shore A Hardness of between about 93 and 97.

10. (original) The adhesive tape of claim 1, wherein said adhesive is pressure sensitive.

11. (previously presented) An adhesive tape comprising:

a polymer layer having a Shore A Hardness of between about 92 and 100; and

a layer of pressure sensitive adhesive comprising a first side and an opposed second side, the first side being in direct and uninterrupted contact with the polymer layer where the adhesive tape comprises an average thickness between 65 mil and 69 mil.

12. (previously presented) An adhesive tape for application to a flooring environment comprising:

a polymer layer having a thickness between 0.020" and 0.065", the polymer layer defining a first side; and

a double sided adhesive layer where one side of the double sided adhesive layer is in substantially continuous contact with the first side of the polymer layer and an opposing side of the double sided adhesive layer is disposed to adhere to the flooring environment;

where the adhesive tape has a peel adhesion greater than 2.0 lb/in width.

IX. EVIDENCE APPENDIX

Attached herewith, please find true and correct copies evidence entered by the examiner and relied upon by the Applicant in this Appeal. Citations to specific portions of these documents may be found in the Applicant's argument in section VII above.

TAB A: October 19, 2006 Office Action

TAB B: Pre-Appeal Brief

TAB C: Guenther Reference

TAB D: Maurer Reference

TAB E: Hughart Reference

TAB F: Oace Reference

X. RELATED PROCEEDINGS APPENDIX

None

A

Office Action Summary	Application No.	Applicant(s)	
	10/674,108	GOECKE, THOMAS R.	
	Examiner	Art Unit	
	Nasser Ahmad	1772	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 June 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7 and 9-12* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7 and 9-12* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Applicant's request for reconsideration of the finality of the rejection of the last Office action is persuasive and, therefore, the finality of that action is withdrawn. The withdrawl notice was mailed on 8/3/2006 and was based on the pre-Appeal Brief request made by the applicant on 6/26/2006.

Rejections Withdrawn

2. Claims 1- 6 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maurer (5839977) made in the last Office action of 3/23/2006 has been withdrawn in view of the request for pre-Appeal Brief filed on 6/26/2006.

3. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Guenther (6461715) made in the last Office action of 3/23/2006 has been withdrawn in view of the request for pre-Appeal Brief filed on 6/26/2006..

4. Claims 7,10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maurer in view of Guenther made in the last Office action of 3/23/2006 has been withdrawn in view of the request for pre-Appeal Brief filed on 6/26/2006.

Response to Arguments

5. Applicant's arguments with respect to claims 1-7 and 9-12 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 1- 6, 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oace (2559990) in view of Hughart (6668501).

Oace relates to an adhesive tape comprising a polymer backing film of 4 to 20 mils thickness (col. 4, lines 21-22) and an adhesive layer contacting the backing film (col. 5, lines 44-47). The backing can be polyvinyl chloride (col. 4, lines 43-60). However, Oace fails to expressly teach that the backing film has a Shore A Hardness of 92-100.

Hughart discloses an adhesive tape comprising a backing (36) of polymeric material such as polyvinyl chloride having Shore A Hardness of 92 and an adhesive layer attached thereto (col. 2, lines 38-45). Figures 1 and 3 shows the backing to be of substantially uniform thickness. Therefore, it would have been obvious to one having ordinary skill in the art to utilize Hughart's teaching of providing an adhesive tape backing of polyvinyl chloride having a Shore A Hardness of 92 in the invention of Oace with the motivation to provide for hardness imparted for structural strength to the tape.

For claim 2, Hughart teaches a substrate (30) is attached to the outermost side of the adhesive layer.

Regarding claim 3, the presence of a textured surface on the backing is inherent of the backing to be able to bond to the adhesive layer.

Claim 5 is disclosed in col. 7, lines 66-67, wherein pigments can be added to the backing layer.

For claim 6, the tape backing is of polyvinyl chloride material is well in the art to be transparent (col. 7, lines 43-44).

For claim 9, it would have been obvious optimization, based on routine experimentation, to provide the backing of Hughart to have Shore A Hardness of 93-97 for optimizing the hardness of said backing polymer layer.

8. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Oace in view of Guenther (6461715).

Oace, as discussed above fails to teach that the peel adhesion of the adhesive layer is greater than 2.o lb/in width. Guenther relates to an adhesive tape comprising a polymer layer (11) having a thickness of 50-500 microns (col. 7, lines 19-25) and a first side of the polymer layer has a double-sided adhesive layer (12) because it has two sides of adhesive surface. As shown in figure-2, one side of the adhesive layer is in substantially continuous contact with the first side of the polymer layer. The adhesive tape can be a pressure sensitive adhesive tape, including rubber-based adhesive (col. 8, lines 36-40). The tape has a peel adhesion of at least 3.5 N/cm (col. 8, lines 10-16), which would include the claimed peel adhesion of greater than 2.0 lb/in width. Therefore, it would have been obvious to one having ordinary skill in the art to utilize guenther's teaching by providing the adhesive layer to have a peel adhesion of at least 3.5 N/cm, which

includes the claimed range of "greater than 2.0 lb/in width, in the invention of Oace with the motivation to provide for improved peel adhesion.

The intended use phrases such as "for application", "to adhere", etc. have not been given any patentable weight because said phrases are not found to be of positive limiations

9. Claims 7,10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Oace in view of Hughart and Guenther

Oace and Hughart, as discussed above, fails to teach that the adhesive is a rubberized double-sided tape. Guenther, also discussed above, relates to a double-sided pressure sensitive adhesive (PSA). Therefore, it would have been obvious to one having ordinary skill in the art to utilize Guenther's teaching of using a double-sided rubberized pressure sensitive adhesive tape in the invention of Maurer with the motivation to provide for enhancing its peel adhesion characteristics.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nasser Ahmad whose telephone number is 571-272-1487. The examiner can normally be reached on 7:30 AM to 5:00 PM, and on alternate Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Harold Pyon can be reached on 571-272-1498. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Nasser Ahmad 10/16/06
Primary Examiner
Art Unit 1772

N. Ahmad.
October 16, 2006.

Notice of References Cited	Application/Control No. 10/674,108	Applicant(s)/Patent Under Reexamination GOECKE, THOMAS R.	
	Examiner Nasser Ahmad	Art Unit 1772	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2,559,990	07-1951	OACE RALPH J; et. al.	428/337
*	B	US-6,668,504	12-2003	Hughart, Jeffrey S.	52/481.1
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

B

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of	: THOMAS R. GOECKE	Examiner	: NASSER AHMAD
Application No.	: 10/674,108	Group Art	: 1772
Filing Date	: SEPTEMBER 29, 2003	Docket No.	: 29006-2 (new)
Confirmation No.	: 2438		
Title	: ADHESIVE TAPE		

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

PRE-APPEAL BRIEF REQUEST FOR REVIEW

Dear Examiner:

This cover sheet is in lieu of PTO/SB/33.

Applicant requests review of the Final Rejection in the above-identified application. No amendments are being filed with this request.

This request is being filed with a concurrent Notice of Appeal. The review is requested for the reasons stated below (5 pages or fewer).

In re Goecke
Ser No.: 10/674,108, Filed: 9/29/03
Docket No.: 29006-2
Pre-Appeal Brief Request for Review

CLAIM SUMMARY

Claims 1-6 and 9 have been rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent 5,839,977 to Maurer ("Maurer");

Claim 12 stands rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent 6,461,715 to Guenther ("Guenther"); and

Claims 7, 10 and 11 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Maurer in view of Guenther.

REMARKS

Applicant respectfully traverses the final rejection of all the claims presently of record. To conform with the guidelines of the Pre-Appeal Brief Conference Pilot Project, Applicant limits the remarks here to those items believed to be clearly erroneous as set forth below.

As to Claims 1-6 and 9, the Office fails to make a prima-facie showing of obviousness. Specifically, the Office equates the claimed element "polymer layer" with the base member (54) of the Maurer reference. The Office concedes that Maurer teaches its base member as having a thickness of 0.08 to 0.14 inches (Final Office Action dated 3/23/06, paragraph 5, line 5). As this taught range clearly does not encompass the claimed range of 0.020 to 0.065 inches, the Office identified a different feature in the Maurer reference. Instead of continuing to reference the thin base member, the Office shifted its attention to an embodiment having a stepped configuration (Figure 14) showing an appliqué (98) evenly divided into thirds. The thickest portion, that is the third identified by reference numeral 112, is disclosed as having a thickness of 0.048 inches.

The Office concludes that since this portion was within the claimed range, that Claim 1 was an obvious combination.

This is incorrect for several reasons. First, claim 1 calls for, among others, a polymer layer having a substantially uniform thickness...." The multi-stepped feature of Figure 14 clearly does not meet the substantially uniform limitation. Here, the Office has merely located a protrusion within the claimed range and disregarded the multi-stepped features including the presence of the two thinner steps.

Second, the claim calls for, among others, a polymer layer having a thickness of between about 0.020" to 0.065". While Maurer may teach a substantially uniform polymer layer in the element identified as the base member (54), there is no motivation to double or quintuple its thickness to reach the claimed range.

Additionally, the change suggested by the Office, providing a substantially uniform thickness (that is without protrusions), would render Maurer unfit for its intended purpose. Specifically, the protrusions taught by Maurer are employed to control the spin imparted on a hockey puck (column 9, line 52 bridging to column 10, line 5). Removing the protrusions (that is, leaving a substantially uniform thickness on the polymer layer) would destroy Maurer's intended use.

Alternatively, if the embodiment illustrated by Figure 14 were altered to a substantially uniform thickness, again the reference would be rendered unfit for its intended purpose. In this instance, the defect is revealed by the varying thickness of the neighboring ridges of the Figure 14 embodiment being intended to deflect a hockey puck in a downward direction. That is,

toward the surface of the ice (column 13, line 46-53). Were the ridges uniformly thick, as claimed, the puck's deflection angle would be merely a function of spin and angle of incidence.

Therefore, the rejection of Claims 1-6 and 9 are clearly improper, and the rejection should be withdrawn and the claims passed to allowance.

Regarding Claim 12, the Office posits that Guenther's teaching of a 500 micron backing (11) meets the claimed thickness of between 0.020 and 0.065 inches. This is incorrect. Readily available conversion tables reveal that 500 microns is less than 0.020 inches[1]. Thus, Guenther does not teach a thickness within the claimed range and the rejection should be withdrawn and the claim passed to allowance.

Regarding Claims 7, 10 and 11, the Office has made no attempt to show that the combination proposed by the Office is suggested by either Maurer or Guenther. In particular, it is questionable whether an artisan dealing with hockey tape would encounter the teachings described in the diaper affixing apparatus of Guenther. Moreover, as the intended use of the Maurer tape is in close proximity to ice and likely to be employed in cold environments it is questionable that the rubberized double sided tape of Guenther would retain its function.

Additionally, the Office's assertion at paragraph 7 that the motivation to combine the references is to provide for enhanced peel adhesion is unfounded. Maurer appears to be concerned with controlling the direction of a hockey puck rather than improving peel characteristics. Indeed, Maurer appears satisfied with an adhesive "similar or identical" to that used on then current hockey tapes (column 9, lines 41-43). Thus, because there is no motivation

[1] Micron x 0.0000394 = inches
500 x 0.0000394 = 0.019685

to make the combination proposed by the Office, these rejections are improper and should be withdrawn.

CONCLUSION

For the reasons above, Applicant believes the final rejection of the claims pending in the present application to be improper. Review, reconsideration and reversal are respectfully requested.

While no fees are believed due, the Commissioner is hereby authorized to charge any necessary fees to Deposit Account No. 02-2051, referencing Attorney Docket No. 29006-2.

Respectfully submitted,

Dated: June 22, 2006

By: _____

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(12) **United States Patent**
Guenther et al.

(10) **Patent No.: US 6,461,715 B1**
(45) **Date of Patent: Oct. 8, 2002**

(54) **ARTICLE CLOSURE TAPE FOR AN ABSORBENT**

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(73) Assignee: **3M Innovative Properties Company**, St. Paul, MN (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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PCT Pub. Date: **Jan. 28, 1999**

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(51) **Int. Cl.**[7] **B32B 3/10**
(52) **U.S. Cl.** **428/131**; 428/136; 428/198; 428/117.3; 428/149; 428/99; 428/343
(58) **Field of Search** 428/131, 136, 428/198, 343, 117.3, 149, 99

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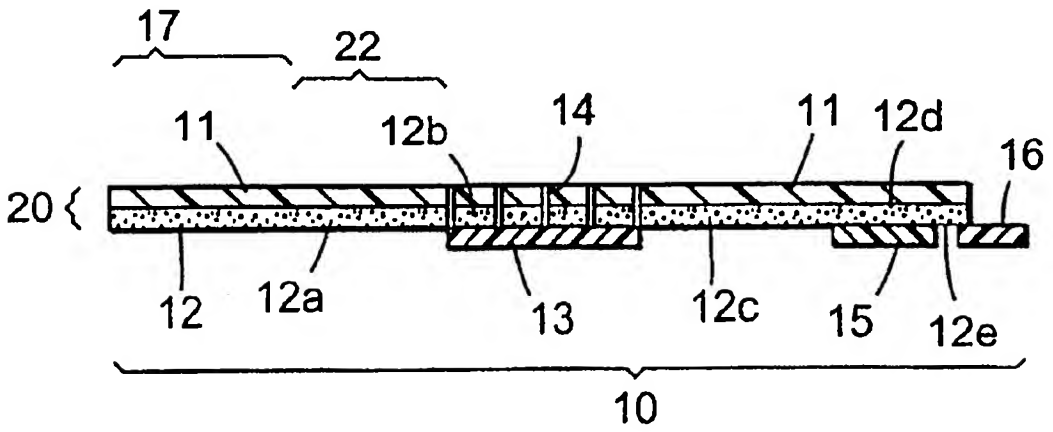
(57) **ABSTRACT**

The present invention refers to a closure tape (**10**) for an absorbent article, particularly for a disposable diaper (**1**), for fastening of the article on the body of a person, the closure tape being attachable to the outside surface (**3**) of the diaper (**1**) through one of its end portions (**17**) and comprising a backing (**11**) bearing a continuous or discontinuous adhesive layer (**12**), a fastening means (**15**) and a stretchable elastic sheet (**13**), the backing (**11**) being essentially non-elastic and/or essentially non-extensible, the support sheet comprising the backing (**11**) and the continuous or discontinuous adhesive layer exhibiting one or more incisions (**14**) in the area of the elastic sheet with at least one of the incisions extending in machine direction over the full width of the backing (**11**) and the end portion (**17**) being separated from the incision (**14**) closest to the end portion (**7**), by a sufficiently large distance (**22**) to prevent the incisions (**14**) essentially from opening when attaching the end portion (**17**) to the outside surface (**3**) of the diaper (**1**) and bending the remaining part of the closure tape (**10**) to contact the inside surface (**2**) of the diaper (**1**).

10 Claims, 6 Drawing Sheets



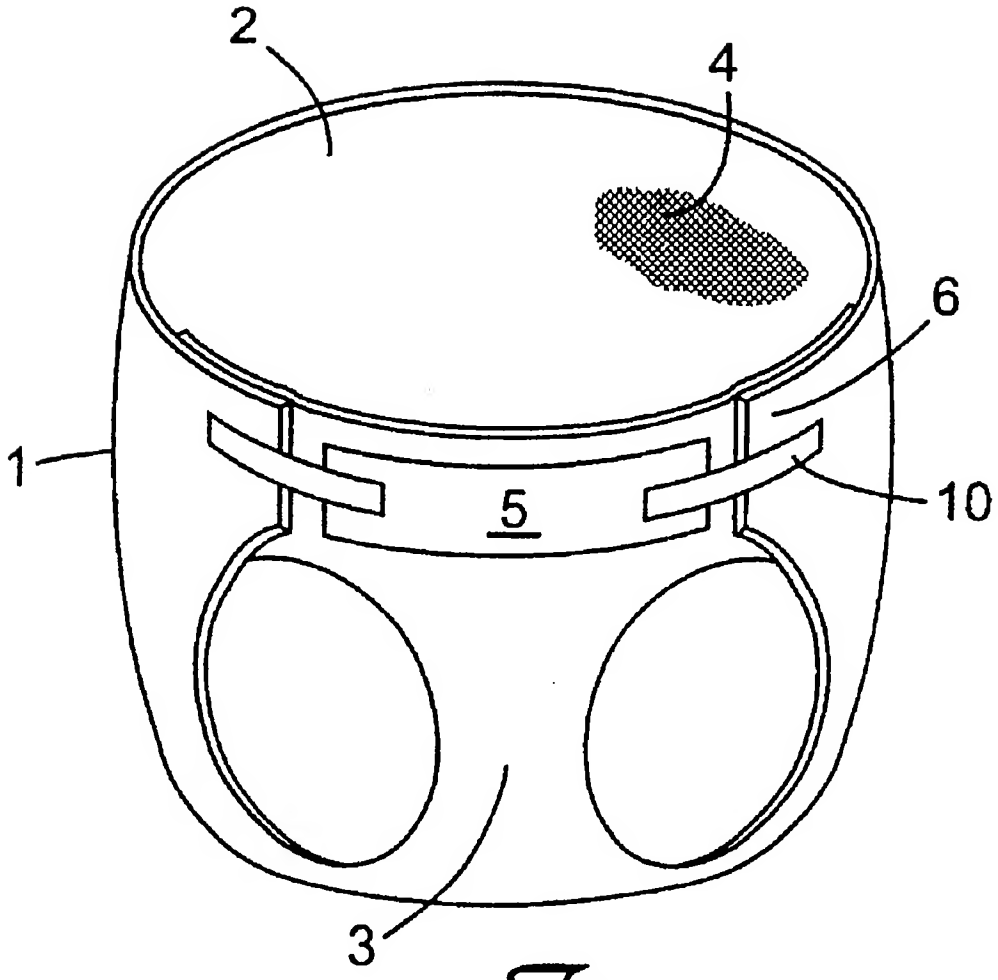


Fig. 1

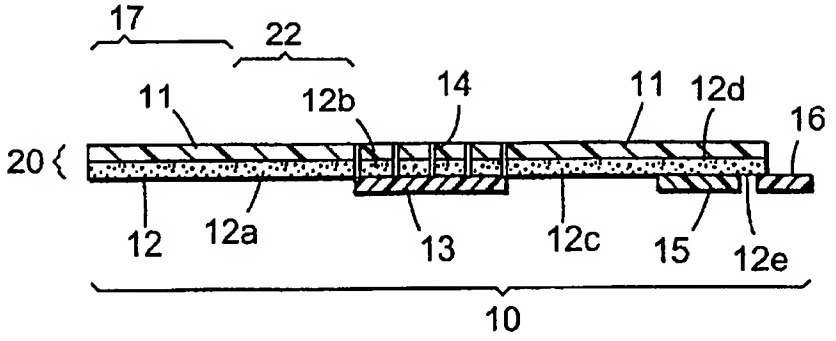


Fig.2

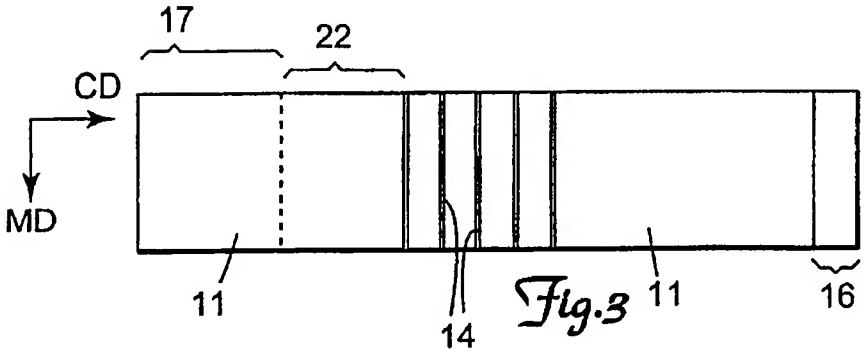


Fig.3

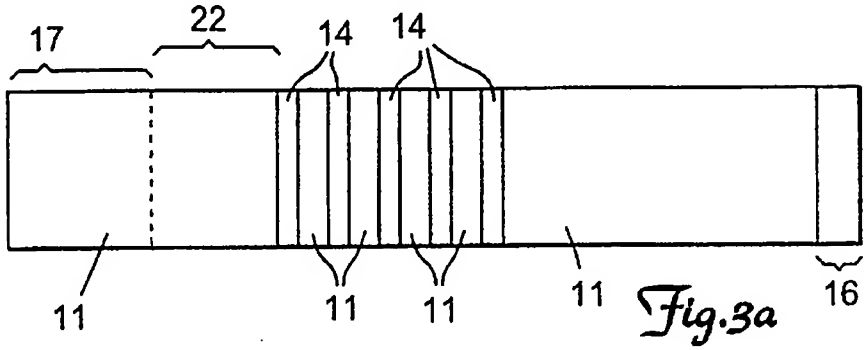


Fig.3a

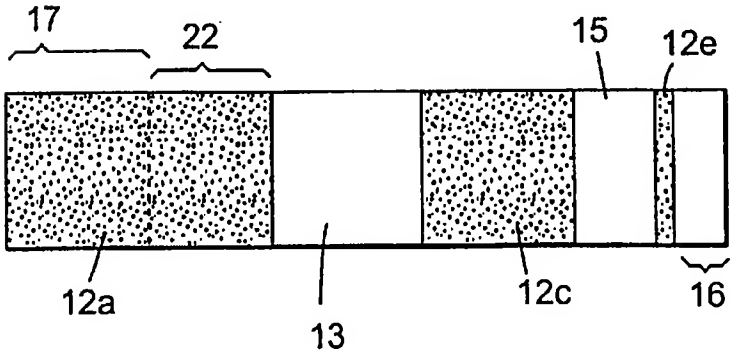


Fig.4

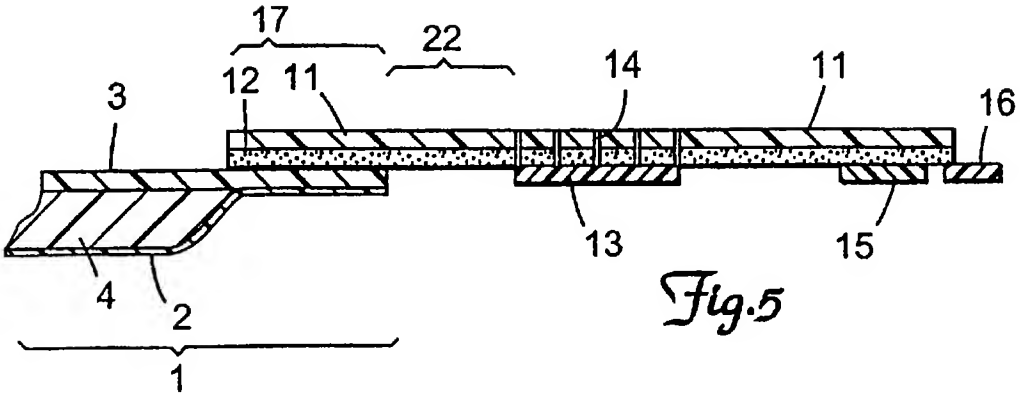


Fig.5

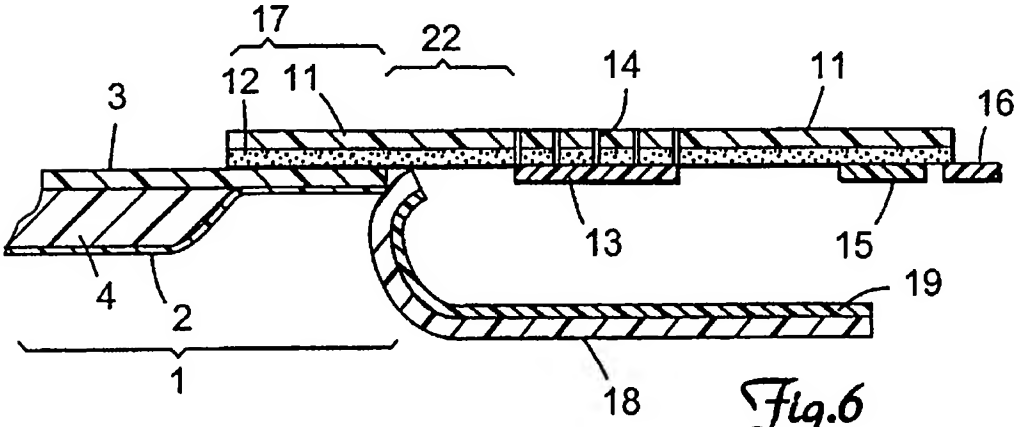


Fig.6

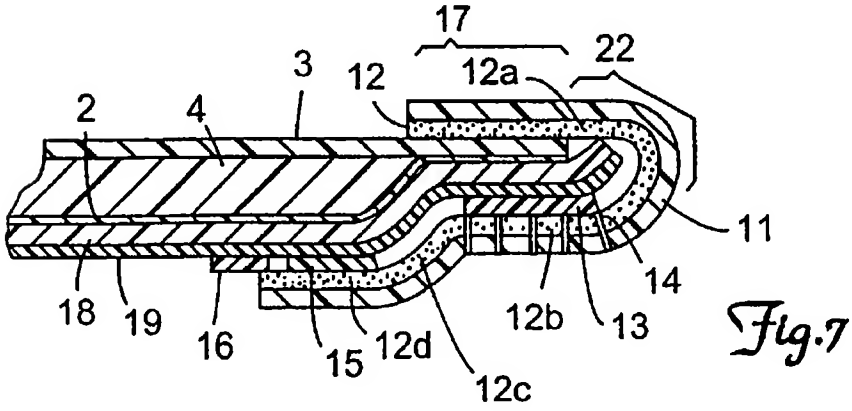


Fig.7

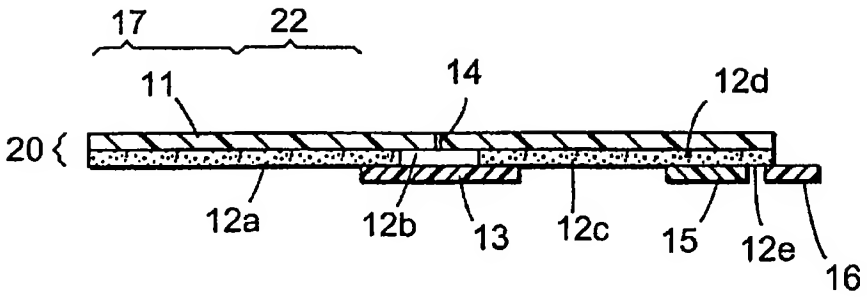


Fig.8

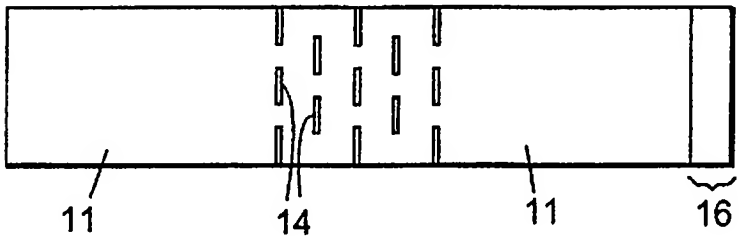


Fig.9

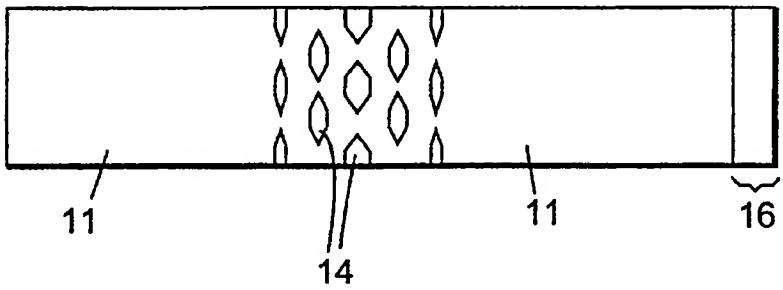


Fig.9a

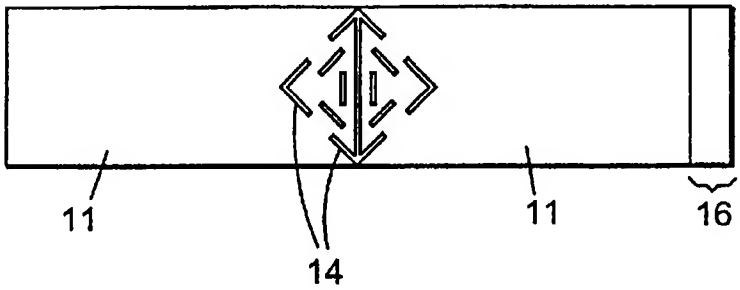


Fig.10

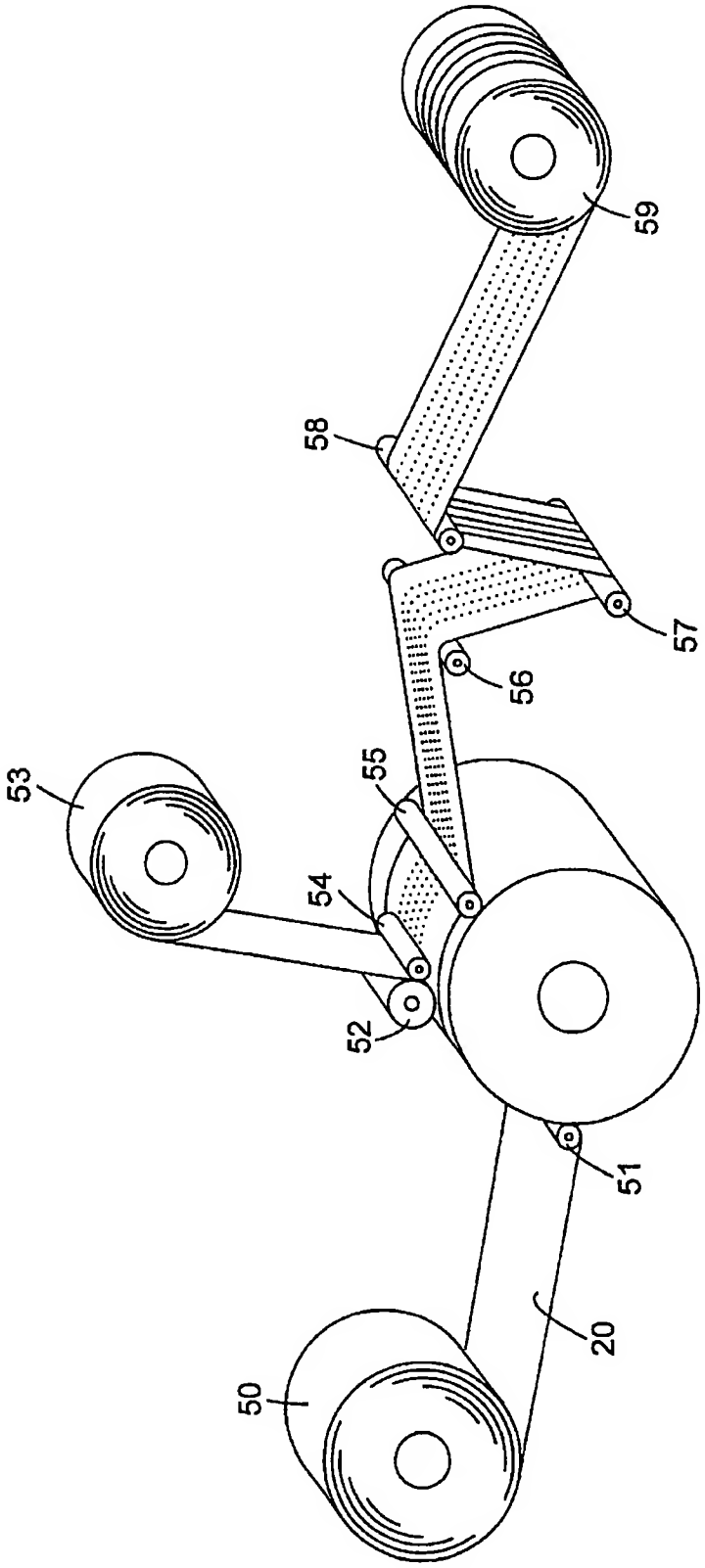


Fig. 11

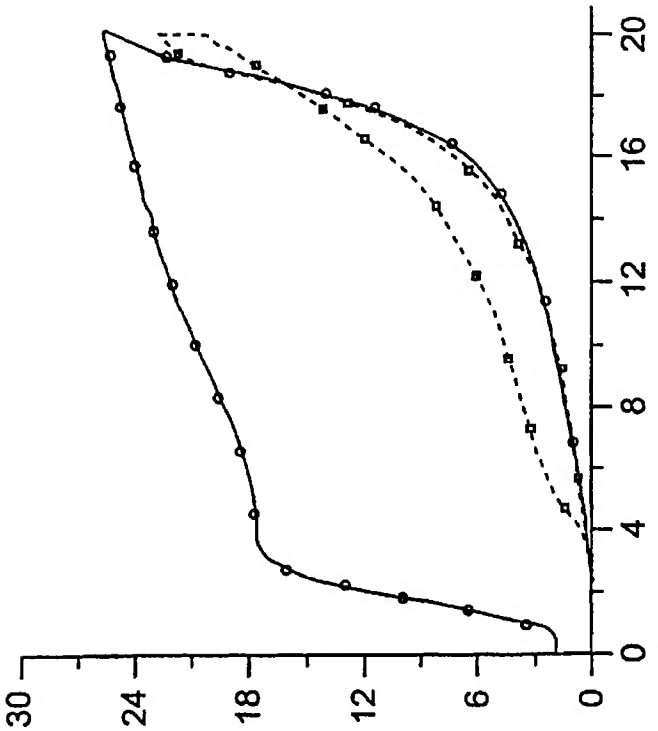


Fig.13

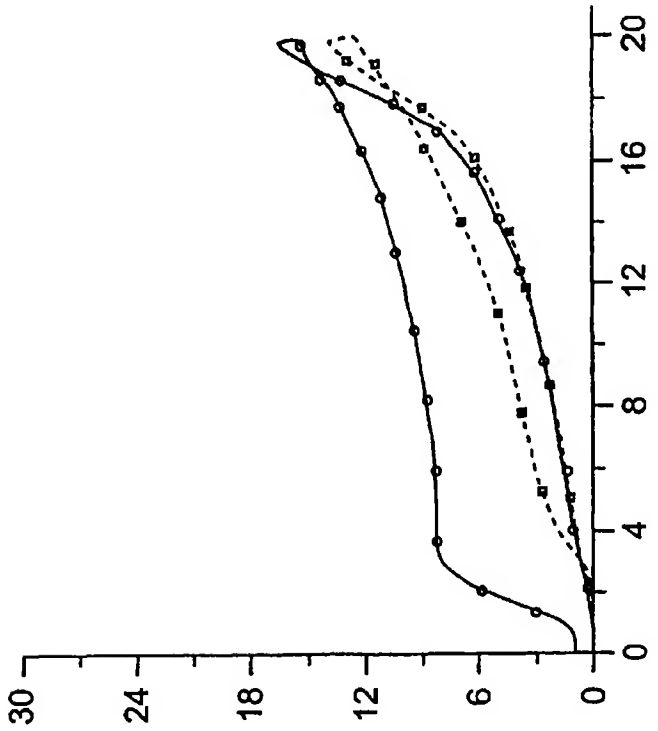


Fig.12

ARTICLE CLOSURE TAPE FOR AN ABSORBENT

FIELD OF THE INVENTION

The invention relates to a closure tape for an absorbent article, particularly for a disposable diaper, for fastening of the article on the body of a person, said closure tape being attachable to the absorbent article through one of its end portions and comprising a backing, a fastening means and an elastic sheet to render the closure tape elastically stretchable. The invention furthermore relates to a prelaminated closure tape in a stable roll from which the closure tape can be cut.

BACKGROUND OF THE INVENTION

Absorbent articles such as disposable diapers are provided with closure tapes which are anchored to the absorbent article through one of its end portions by means of, for example, a pressure-sensitive adhesive layer. The opposite end portion of the closure tape comprises a fastening means to close the absorbent article around the wearer's body and fasten the absorbent article on the body. Among these closure tapes, there have also been described elastically stretchable tapes to improve the fit and the comfort of the absorbent article.

U.S. Pat. No. 3,800,796 discloses a diaper with semi-elastic strip fasteners having a freely extensible elastic central segment and two non-extensible inelastic terminal segments. A similar construction is also described in EP 0,249,073 wherein the boundary regions between the elastic middle portion and the two non-elastic end portions are formed by melt-extrusion of both or either of the elastic material and the non-elastic material in order to provide integral bonding between the segments. EP 0,247,855 provides a composite prelaminated closure tape which can be dispensed from a stable roll form to provide a closure with a central elastomeric sheet. The prelaminated closure tape is securely fastened to the inside and outside surface of one edge of the diaper. The attached closure tape comprises a central elastomeric portion and two anchor strips as end portions.

The elastically stretchable closure tapes described in U.S. Pat. No. 3,800,796, EP 0,249,073 and EP 0,247,855 comprise an elastic middle portion between two non-elastic end portions or anchor strips. While these closure tapes are useful and of commercial importance they are sometimes disadvantageous in that the method of preparing them is relatively complicated and requires secure bonding of the tape segments.

In another group of references the elastically stretchable closure tape comprises an elastic backing. U.S. Pat. No. 4,063,559 discloses a disposable diaper with a closure tape having an extendible or stretchable backing made from a variety of materials comprising, for example, plasticized polyvinyl chloride films, polyolefin films, polyurethane films, vinyl chloride and vinylidene chloride copolymer films, rubber hydrochloride films, polyamide films or elastomeric films derived from styrene-butadiene or styrene-isoprene block copolymers. The backing bears an adhesive layer with a partible protective cover means on top of it. The protective cover is substantially coextensive with the adhesive coating when the closure tape is in a non-extended storage position, but is parted when the closure tape is stretched into the working position, thereby making portions of the adhesive coating available for use in securing the diaper to the body of an infant. The protective cover means may comprise discontinuous slits which form discrete apertures when stretched. Alternatively, the protective cover means may be an embossed, rupturable thermoplastic web or a unitary web provided with spaced, weakened regions which rupture when the web is stretched.

EP 0,191,355 discloses a fastening tape for a disposable diaper comprising a base tape or a backing carrying thereon an adhesive layer wherein the backing when subjected to stress (tension) and subsequently strain (elongation), shows a hysteresis curve with a hysteresis loss ratio of between 20 to 80%. The backing may include a plurality of weakened areas in various geometrical shapes (see FIGS. 9–12), among them discontinuous slits extending orthogonally with respect to the long axis of the backing (cross direction). In an alternative embodiment, EP 0,191,355 describes a fastening tape having two non-elastic end portions and an elastic middle portion made from an elastic material having a hysteresis loss ratio of between 20 to 80%. Using closure tapes with elastically stretchable backings is sometimes disadvantageous because the closure tape which is attached to the diaper may exhibit an insufficient rigidity orthogonal to the long axis of the backing (machine direction) and be floppy.

EP 0,704,196 describes a fastening tape having a stretchable elastic portion which is a sandwich structure of a stretchable elastic tape and a non-elastic backing whereby the elastic tape is secured to the non-elastic backing at least at both ends thereof to bridge a section of the backing which is longer than the elastic tape section and may assume, for example, a zigzag folding shape. If the fastening tape is stretched into a predetermined position, the elastic tape extends and the zigzag-form of the non-elastic backing disappears. The rigidity of the fastening tape in machine direction in the relaxed state is determined by the non-elastic backing. In the construction of EP 0,704,196 it is sometimes difficult to reliably adhere the elastic tape to the zigzag-shaped non-elastic backing.

U.S. Pat. No. 4,834,820 discloses a closure tape having an elastic sheet extending over the whole length of the closure tape and a non-flexible retaining sheet partly bonded to the flexible sheet. The retaining sheet may comprise one or two cut-off grooves. The retaining sheet is ripped apart along the cut-off grooves thus rendering the closure tape elastic, and the central portion of the retaining sheet may be removed in one embodiment (FIGS. **4** and **5**). The closure tape is claimed not to interfere with the abdominal respiration of the baby after wearing and eliminates the need for peeling off the tape for checking for urination and stool.

U.S. Pat. No. 4,795,456 discloses an extensible diaper closure tape which comprises an extensible layer **4** uninterruptedly extending over the whole length of the tape. The extensible layer bears on one side a carrier web layer with an unwind release coating the carrier web layer being attached to the flexible layer with a first adhesive layer. The carrier web layer exhibits one or more incisions, and the adhesive layer beneath the slits may or may be not be removed. The other side of the extensible layer carries a second adhesive layer which may be slitted in the same area where the first adhesive layer on the opposite side of the extensible layer exhibits an incision. A non-extensible layer bearing on the exposed side a third adhesive layer, is attached to the second adhesive layer. The non-extensible layer is permanently adhered to the second adhesive layer in the area from the manufacturer's end to the incisions, and it is releasably adhered to the second adhesive layer in the area from the user's end to the incisions. The tape is attached to the outside surface of the diaper with the third adhesive layer at the manufacturer's end and bent around the edge portion

of the diaper thus adhering the user's end with the third adhesive layer to the inside surface of the diaper prior to use. When deployed, the closure tape opens along the release coating between the second adhesive layer and the non-extensible layer which remains adhered to the edge portion of the diaper. The user's end which has been rendered flexible by the deployment can be used to secure the diaper to the wearer. The closure tape of U.S. Pat. No. 4,795,456 is non-extensible in the initial state prior to use but rendered extensible on deployment which is advantageous. On the other hand, the closure tape is secured to the outside surface of the diaper only. This peel mode type of attachment offers a relatively low bonding strength and may fail when securing the diaper around the wearer's body or during use. Prior to deployment, the slits which are in the area where the tape is being bent around the edge portion of the diaper, open at least partly thus rendering the surface of the tape coarse which is less preferred. The slits are furthermore easily contaminated.

Therefore there was a need for an elastically stretchable closure tape which is easy to manufacture and does not exhibit the shortcomings of the closure tapes available in the state of the art or exhibits them to a lower degree only. Other objects of the present invention are evident from the following detailed description of the invention.

SUMMARY OF THE INVENTION

The present invention refers to a closure tape **10** for an absorbent article, particularly for a disposable diaper **1**, for fastening of the article on the body of a person, the closure tape **10** being attachable to the outside surface **3** of the diaper **1** through one of its end portions **17** and comprising a backing **11** bearing a continuous or discontinuous adhesive layer **12**, a fastening means **15** and a stretchable elastic sheet **13**, the backing **11** being essentially non-elastic and/or non-extensible, the support sheet **20** comprising the backing **11** and the continuous or discontinuous adhesive layer **12** exhibiting one or more incisions **14** in the area of the elastic sheet with at least one of the incisions extending in the machine direction (direction orthogonal to the long axis of the closure tape) over the full width of the backing **11**, and the end portion **17** being separated from the incision **14** closest to **10** the end portion **17**, by a sufficiently large distance **22** to prevent the incisions **14** essentially from opening when attaching the end portion **17** to the outside surface **3** of the diaper **1** and bending the remaining part of the closure tape **10** to contact the inside surface **2** of the diaper **1**.

The invention furthermore refers to a prelaminated closure tape in a stable roll from which the closure tape **10** according to the invention can be cut, and to an absorbent article, in particular a diaper **1**, comprising a closure tape according to the invention.

BRIEF DESCRIPTION OF FIGURES

FIG. **1** is a perspective representation of a disposable diaper **1** in a closed form, said diaper having an absorbent core **4** between an inside surface **2** and an outside surface **3**, closure tapes **10** anchored to the edge portions **6** of the diaper and fastened to the target area **5** on the outside surface of the diaper.

FIG. **2** is a cross-sectional view of a preferred embodiment of the closure tape **10** in the relaxed state (no tension forces applied), said closure tape having a support sheet **20** comprising a backing **11** bearing a continuous adhesive layer **12** in areas **12***a*–**12***e*, an elastic sheet **13**, fastening means **15**, a finger-lift **16** and incisions **14** in the area **12***b* of the elastic sheet **13**. The manufacturer's end **17** is separated from the incision **14** closest to it, by the distance **22**, and the user's end **21** comprises the fastening means **15**, the adhesive area **12***e* and the finger-lift **16**.

FIG. **3** is a top view of the embodiment of the closure tape **10** of FIG. **2** in the relaxed state, showing the backing **11** bearing parallel incisions **14** in the area **12***b* of the elastic sheet **13** which extend over the full width of the closure tape **10** in the machine direction.

FIG. **3***a* is a top view of the closure tape **10** of FIG. **2** with a tension force being applied, showing that the incisions **14** have split apart to form essentially rectangular and essentially equally spaced openings.

FIG. **4** is a bottom view of the embodiment of the closure tape **10** of FIG. **2** in the relaxed state showing the exposed continuous adhesive layer **12** in areas **12***a*, **12***c* and **12***e*, the end portion **17** of the closure tape to be attached to the outside surface **3** of the disposable diaper, the elastic sheet **13**, the fastening means **15** and the finger-lift **16**.

FIG. **5** is a schematic cross-sectional view of the embodiment of the closure tape **10** of FIG. **2** (relaxed state) being attached to the outside surface **3** of the diaper only in a peel mode type of attachment.

FIG. **6** is a schematic cross-sectional view of the embodiment of the closure tape of FIG. **2** (relaxed state) which is attached to the outside surface **3** of the diaper **1** and which is additionally attachable to the inside surface **2** of the diaper **1** by means of release sheeting **19** bearing adhesive layer **18** to provide for a shear mode type or Y type of attachment.

FIG. **7** is a schematic cross-sectional view of the embodiment of the closure tape of FIG. **2** before deployment with the closure tape **10** being folded over to contact the inside surface **2** of the diaper **1**.

FIG. **8** is a cross-sectional view of another preferred embodiment of the closure tape **10** in the relaxed state, said closure tape **10** having a support sheet **20** comprising a backing **11** bearing a discontinuous adhesive layer in areas **12***a*, **12***c*, **12***d* and **12***e*, an elastic sheet **13**, a fastening means **15**, a finger-lift **16** and one incision **14** in the area **12***b* of the elastic sheet **13**.

FIG. **9** is a top view of a closure tape in the relaxed state which is not an embodiment of the closure tape **10** of the present invention, said closure tape comprising a backing **11** having partial incisions **14** in the area of the elastic sheet **13**, said partial slits being arranged in lines whereby the partial incisions of one line face the bridges between the partial incisions in an adjacent line.

FIG. **9***a* is a top view of the closure tape of FIG. **9** with a tension force being applied, showing that the incisions have split apart to form essentially hexagonal openings, whereby the extension of the openings in cross direction is smaller for openings located in the outer lines.

FIG. **10** is another embodiment of a closure tape **10** of the present invention (relaxed state) having in the area **12***b* of the elastic sheet **13** one full central incision and a number of partial incisions which are arranged to give the configuration of a parallelogram in the area **12***b* of the elastic sheet **13**.

FIG. **11** is a schematic representation of a laminator for preparing laminates useful as precursors of closure tapes **10** of the present invention, said laminator comprising a supply roll **50** for the support sheet **20** comprising the backing **11** bearing the continuous or discontinuous adhesive layer **12**, a rotary cutting wheel **52** for slitting the support sheet, a supply roll for the elastic sheet **13**, a bonding roll **54** for

bonding the elastic sheet to the support sheet, rollers **51**, **55**, **56**, **57** and **58**, and a storage roll **59** for the laminate.

FIG. **12** is a hysteresis loss curve recorded for a laminate as shown in FIG. **9** having a backing **11** bearing a continuous adhesive layer **12**, an elastic sheet **13** in area **12***b* and five parallel, equally spaced full incisions in the area **12***b*.

FIG. **13** is a hysteresis loss curve recorded for a laminate as shown in FIG. **10** having a backing **11** bearing a continuous adhesive layer **12**, an elastic sheet **13** in area **12***b* and partial incisions arranged in five parallel and equally spaced lines in the area **12***b*.

DETAILED DESCRIPTION OF THE INVENTION

The closure tapes **10** of the present invention are useful and beneficial when attached to an absorbent article and, in particular, to a disposable absorbent article. As used herein, the term "disposable absorbent article" refers to articles which are placed against or in proximity to the body of the wearer to absorb and contain the various exudates discharged from the body and which are intended to be disposed of after single use (i.e., they are not intended to be laundered or otherwise restored or reused).

A preferred embodiment of the disposable absorbent article of the present invention is a diaper. As used herein, the term "diaper" refers to a garment generally worn by infants or incontinent persons that is drawn up between the legs and fastened about the waist of the wearer.

FIG. **1** is a partially cut-away perspective representation of a disposable diaper **1** in a closed form. The diaper comprises an absorbent core **4** between an inside surface **2** and an outside surface **3**. The absorbent core **4** may be any means which is generally compressible, conformable, non-irritating to the wearer's skin, and capable of absorbing and retaining liquids and certain body exudates.

The outside surface **3** of the diaper is impervious to liquids and is preferably manufactured from a thin plastic film, although other flexible liquid impervious materials may also be used. The outside surface **3** prevents the exudates absorbed and contained in the absorbent core **4** from soiling articles which contact the diaper **1** such as bedsheets and undergarments.

The inside surface **2** of the diaper is compliant, soft-feeling, and non-irritating to the wearer's skin. Further, the inside surface **2** is liquid previous permitting liquids to readily penetrate through its thickness. A suitable inside surface **2** may be manufactured from a wide range of materials such as porous foams, reticulated foams, apertured films, natural fibers (e.g., wood or cotton fibers), synthetic fibers (e.g., polyester or polypropylene fibers) or from a combination of natural and synthetic fibers. Preferably, it is made of a hydrophobic material to isolate the wearer's skin from liquids retained in the absorbent core **4**. A suitable inside surface **2** may be, for example, a spunbond or carded polypropylene nonwoven of approximately 15–25 g/m^2.

The absorbent core **4** may be secured to the outside surface **3** by means of, for example, pressure-sensitive adhesives, hot melt adhesives or other adhesives, ultrasonic bonding or heat/pressure sealing. The outside surface **3** and the inside surface **2** may be joined to each other directly or indirectly by using an intermediate fixing member to which the outside surface **3** and the inside surface are affixed. The inside surface **2** and the outside surface **3** may be associated together by various means comprising, for example, pressure-sensitive adhesives, hot melt adhesives or other adhesives, ultrasonic bonding and/or heat/pressure.

The above description of the diaper **1** is meant to be explanatory only and not limiting. Further details on diapers and their construction are described in literature and may be taken, for example, from EP 0,529,681, U.S. Pat. No. 4,036,233, EP 0,487,758, WO 96/10,382, U.S. Pat. No. 3,800,796, EP 0,247,855 or U.S. Pat. No. 4,857,067.

The closure tape **10** is secured to the edge portion **6** of the diaper **1**. The closure tape **10** can be attached only to the outside surface **3** of the diaper as shown in FIG. **5** or both to the outside surface **3** and inside surface **2** of the diaper as can be taken from FIG. **6** in order to anchor the closure tape **10** to the diaper **1**. The anchoring mode shown in FIG. **5** is termed as peel mode type attachment offering a relatively low bonding strength. Peel mode type anchored closure tapes **10** may loosen when attaching the diaper to the wearer's body and during use so that this type of attachment is usually less preferred. The closure tape **10** shown in FIG. **6** is additionally attachable to the inside surface **2** of the diaper by means of release sheeting **19** bearing adhesive layer **18** to provide a shear mode or Y mode type of attachment. This type of anchoring reliably secures the closure tape **10** to the diaper and is preferred.

Alternatively the manufacturer's end can be bonded in between the outside surface **3** and the inside surface **2** of the diaper.

In the closed state of the diaper **1**, the fastening means **15** of the closure tape **10** is attached to the target area **5**. The target area **5** may be formed of an additional strip which is attached to the outside surface **3** of the diaper **1** in such a manner that the size of the diaper or garment may be adjusted in accordance with the size of the user. The target area can comprise one or more such strips and could also form the entire outside surface **3** of the diaper. The outer surface of the target area **5** is selected to engage with the fastening means **15** of the closure tape **10** in an overlapping configuration to provide a secure side closure. For example, in case the fastening means **15** is a mechanical fastening means and comprises a hook material, the outer surface of the target area will comprise any suitable material which interlocks with hook material such as, for example, woven or non-woven fabrics.

The absorbent article and, in particular, the disposable diaper **1** of the present invention differs from prior art contoured absorbent articles in that it comprises a novel closure tape **10**. Reference is made to FIG. **2** which shows a cross-sectional view of a preferred embodiment of the closure tape.

The closure tape **10** of FIG. **2** comprises a backing **11** which is preferably selected from a group of materials which is essentially non-elastic and imparts a desirable stiffness to the closure tape **10**.

For the purposes of the present invention a material is considered to be elastic in a given direction if a sample of the material (dimensions 25 mm×18 mm×0.1 mm) is stretchable in that direction from a first and generally relaxed length (no external tensional forces applied) to a second or expanded length which is at least two times the first length and upon relaxation, will retract to a third length which is no greater than 1.1 times the first length with these figures referring to the second tension-relaxation cycle. Materials which irreversibly deform when a sample of the material (dimension 25 mm×18 mm×0.1 mm) is stretched in a given direction from a first and generally relaxed virgin state (no external tension force, no cycle comprising application of tension force and release of tension force applied yet) to a second or expanded state with a length of 1.5 times of the first length

so that upon release of the tension force the material remains in the expanded state or retracts to a third state that is at least 1.25 of the first length, or which breaks before being stretched to a length of 1.5 times the original length, are termed as non-elastic with respect to the given direction.

Likewise, for the purposes of the present invention, a closure tape **10** having an elastic sheet **13** comprising a material which meets the above definition, is considered to be elastic or elastically stretchable.

For the purposes of the present invention a material is considered to be inextensible in a given direction if a force of at least 60 N has to be applied to stretch a sample of the material (length 100 mm, width 25 mm, thichness 0.1 mm) in that direction irreversibly or reversibly from a first and generally relaxed virgin state (no external tension force, no cycle comprising application of tensional force and release of tension force applied yet) to a second or expanded state with a length of 1.1 times the first length.

The backing **11** is preferably selected from a group of materials comprising polypropylene, polyvinylchloride, polyethylene terephthalate, polyethylene, polyolefin copolymers or blends of polyolefins such as, for example, blend of polypropylene and LPDE (low density polyethylene), nonwoven and foamed materials. The thickness of the backing is preferably between 50 μm and 500 μm, and more preferably between 100 μm and 400 μm.

The backing **11** bears an adhesive layer **12** which may extend over the whole length of the closure tape **10** as is shown, for example, in FIG. **2** or which may cover only part of the backing as is shown, for example, in FIG. **8**. The adhesive layer **12** may be conceptually divided into different areas **12***a*–**12***e* whereby area **12***a* comprises the end portion **17** of the closure tape **10** and the distance **22** between the end portion **17** and the incision **14** closest to it. Area **12***b* is the part of the adhesive layer **12** in the area of the elastic sheet **13**, area **12***c* corresponds to the area between the elastic sheet **13** and the fastening means **15**, area **12***d* is the part of the adhesive layer **12** in the area of the fastening means **15** and area **12***e* is the part of the adhesive layer at the end of the closure tape bearing the finger-lift **16**.

Part of the area **12***a* of the adhesive layer is used to anchor the end portion **17** of the closure tape **10** to the outside surface **3** of the disposable diaper as is shown, for example, in FIG. **6**. The end portion **17** is also termed as manufacturer's end because it is used to attach the closure tape to the diaper **1** during its manufacture. The opposite end portion **21** of the closure tape **10** comprising fastening means **15**, adhesive area **12***e* and finger-lift **16** is also termed as user's end because it forms the joint made by the user in securing the diaper to the wearer. The remaining part of the area **12***a* extends over the distance **22** between the manufacturer's end **17** and the incision **14** being closest to it. The adhesive layer **18** attached to the release sheeting **19** may be applied to this part of the adhesive layer **12***a* as is shown in FIG. **6**. The distance **22** is selected to be sufficiently large to prevent the incisions **14** essentially from opening when attaching the manufacturer's end **17** to the outside surface **3** of the diaper **1** and bending the remaining part of the closure tape **10** to contact the inside surface **2** of the diaper **1** as is shown in FIG. **7**. The distance **22** ensures that the incisions **14** remain essentially closed when storing the diaper in the state of FIG. **7** prior to use and prevent the incisions from getting contaminated. Furthermore, the surface of the backing offers an aesthetically pleasant and soft appearance.

The extension of distance **22** depends on the concrete construction of the diaper **1** and the closure tape, and it is preferably at least 2 mm, more preferably at least 3 mm and especially preferably at least 4 mm.

The adhesive used in area **12***a* of the adhesive layer is selected to permanently attach the manufacturer's end **17** to the outside surface **3** of the diaper **1** during its manufacture so that the closure tape is not removed from the outside surface **3** of the diaper when the diaper **1** is used and opened or closed several times. The adhesive useful for area **12***a* comprises pressure-sensitive adhesives including pressure-sensitive hot-melt adhesives and non-pressure-sensitive adhesives. The pressure-sensitive adhesives which are preferred, are preferably selected to exhibit a 90° peel adhesion from a polyethylene surface as measured according to a slightly modified test method FTM2, FINAT test method no. 2, FINAT Technisches Handbuch, 4. Auflage (1995), pp. 6–7 of at least 3.5 N/cm, more preferably of at least 5 N/cm and especially preferably of at least 6 N/cm. The test method used deviates from FTM2 in that a 150 μm polyethylene film STA-211 (thickness 150 μm ,adhered to a stainless steel substrate with a double-sided adhesive film) is used as the test substrate and in that the peel adhesion measurement is performed 2 min after applying the adhesive strip to the substrate. The pressure-sensitive adhesive furthermore preferably exhibits a high value of static shear as measured according to a slightly modified test method FTM8, FINAT test method no. 8, FINAT Technisches Handbuch, 4. Auflage (1995), pp. 15–16 of at least 100 min, more preferably of at least 300 min and especially preferably of at least 500 min to ensure that the diaper does not inadvertently come loose from the wearer's body. The test method used deviates from FTM8 in that a weight of 500 g is used instead of 1000 g, and that the temperature is 38±2° C. instead of 23±2° C. and that the test specimen comprises a synthetic rubber film as described in Example 1 as the test substrate and a propylene backing with a thickness of 110 μm with the adhesive to be tested attached to it as the adhesive strip which bears the weight.

Suitable pressure-sensitive adhesives include rubber-based adhesives (also called rubber-resin adhesives) which comprise natural or synthetic rubber materials and typically also tackifying resins in order to render the rubber materials tacky. Preferred examples of rubber-based pressure-sensitive adhesives are the polystyrene polyisoprene block copolymers tackified with synthetic polyterpene resins. Suitable pressure-sensitive adhesives furthermore include acrylate-based pressure-sensitive adhesives such as, for example, those disclosed in U.S. Pat. No. Re 24,906 or U.S. Pat. No. 4,710,536. The adhesives mentioned above are given only by way of example, and the person skilled in the art can select other adhesives known in the state of the art without any inventive effort. The thickness of the adhesive layer in the adhesive area **12***a* preferably is between 10 and 200 μm and more preferably between 20 and 100 μm.

The area **12***b* which corresponds to the area of the elastic sheet **13** may comprise an adhesive layer as is shown, for example, in FIG. **2** or may be essentially free of adhesive as is shown, for example, in FIG. **8**.

In the embodiment of FIG. **2** the adhesive used in area **12***b* preferably is selected to reliably and permanently secure the elastic sheet **13** to the backing **11**. The adhesive of area **12***b* may be pressure-sensitive or non-pressure-sensitive. Pressure-sensitive adhesives are preferred and in an especially preferred embodiment the adhesive of area **12***b* is the same adhesive as used in area **12***a*. The thickness of the adhesive layer in area **12***b* preferably is between 100 μm and 200 μm and more preferably between 20 and 100 μm. It is specifically preferred that the adhesive layer in area **12***b* has the same thickness as the adhesive layer in area **12***a*.

In case the area **12***b* is essentially free from adhesive the elastic sheet **13** may be bonded to the backing **11** in that the adhesive layers of areas **12***a* and **12***c*, respectively, are slightly extended into the area **12***b* with the extending adhesive sections supporting and adhering the elastic sheet **13** to the backing **11** as is schematically shown in FIG. **8**. Alternatively or additionally, the elastic sheet **13** may also be attached to the backing **11** by different methods of welding such as heat welding or ultrasonic welding, respectively. Rotary ultrasonic welding is particularly preferred. Rotary ultrasonic welding devices are commercially available, for example, from Cera, Villars, France, and contact-free ultrasonic welding systems are commercially available from Hermann, Karisbad, Germany. Ultrasonic welding systems are also commercially available from Branson Company, U.S.A. In a specifically preferred embodiment the elastic sheet **13** is attached to the backing by using an adhesive layer extending fully or partly over area **12***b* additionally securing the ends of the elastic sheet by heat welding or ultrasonic welding and, in particular, by ultrasonic welding.

The area **12***c* between the elastic sheet **13** and the fastening means **15** may comprise an adhesive layer as is shown, for example, in FIG. **2** or may be essentially free of any adhesive. Using an adhesive in area **12***c* is especially advantageous in case the fastening means **15** comprises mechanical fastening means such as, for example, hook fastening means which may also be referred to as a male fastening means. Such hook fastening means require corresponding female fastening means such as, for example, fibrous elements of a loop fastening material on the target area to engage with in order to reliably secure the diaper around the wearer. Since the female fastening means is often essentially restricted to the target area **5**, it will typically be tucked underneath other portions of the diaper on folding or rolling up the diaper for disposal. An exposed adhesive layer in area **12***c* can overcome this problem and offer an additional fastening means allowing for convenient disposal of the diaper.

An exposed or partially exposed adhesive layer in area **12***c* and/or area **12***e* releasably adheres the closure tape **10** when being bent over to attach the inside surface **2** of the diaper when storing the diaper prior to use (see FIG. **7**) to the release sheeting **19**. This prevents the closure tape in the bent-over state from "pop-open" which is desirable. Pop-open may also be prevented, for example, by releasable adhering the closure tape **10** to the inside surface **2** of the diaper or the release sheeting **19** by ultrasonic spot welding or spot heat bonding.

The adhesive optionally used in area **12***c* may be a pressure-sensitive adhesive or a non-pressure-sensitive adhesive. Preferably it is a pressure-sensitive adhesive, and the same adhesive as used in area **12***a* is preferably used. Optionally when using the adhesive of area **12***a* in area **12***c*, this adhesive may be partially deactivated, for example, by corona treatment in order to render the adhesive layer in area **12***c* less aggressive and removable. Alternatively, it is possible to cover area **12***c* prior to using it with a release liner which will be removed prior to fastening the rolled-up diaper **1** for disposal. It is furthermore possible to use a different pressuresensitive adhesive in area **12***c* which is less aggressive than the adhesive of area **12***a* and which allows the closure tape **10** to be removably attached to the outside surface **3** of the diaper. Suitable non-permanent acrylate-based pressure-sensitive adhesives are described, for example, in EP 0,736,585, WO 93/13,148 or U.S. Pat. No. 4,599,265. The thickness of the adhesive layer in area **12***c* preferably is between 10 μm and 200 μm and more preferably between 20 μm and 100 μm. The thickness of the adhesive layer in area **12***c*, if present, is especially preferably selected to be the same as the thickness of the adhesive layer in areas **12***a* and, if present, **12***b*.

The area **12***d* which corresponds to the area of the fastening means **15** comprises an adhesive layer which can be pressure-sensitive or non-pressure-sensitive. The fastening means **15** can be a mechanical fastening means, such as, for example, a hook material, or another adhesive layer which may be attached to a carrier sheet or directly laminated to the adhesive layer in area **12***d*. It is also possible that no additional fastening means **15** is attached to the adhesive layer in area **12***d* and that the adhesive layer in area **12***d* is used as fastening means **15**.

In case an additional fastening means **15** is used, this being preferred, the adhesive used in area **12***d* preferably is an aggressive pressure-sensitive adhesive material in order to reliably secure the fastening means **15** to the backing **11**. The pressure-sensitive adhesive may be selected from the group of adhesives described above for use in area **12***a*, and the same adhesive is preferably used in areas **12***a* and **12***d*. In case the additional fastening means **15** is omitted, the adhesive used in area **12***d* is selected so that the diaper can be both reliably secured to the wearer's body when being used, and be easily removed after use. The adhesion behavior of the adhesive used in area **12***d* with respect to the target area **5** is governed both by the nature of the adhesive and the surface properties of the target area **5**. In case the adhesive layer of area **12***d* is used to fasten the diaper to the wearer's body, the target area **5** typically comprises a film which may have a release coating such as, for example, a BOPP film which is commercially available from 3M Company, St. Paul, U.S.A., as Frontal Tape KR-0827 or a cast polypropylene film which is commercially available from 3M Company, St. Paul, U.S.A. as Cast PP Frontal Tape KR-0822. When using an appropriate release surface in target area **5** it is often possible to use aggressive pressure-sensitive adhesives such as those described above for use in area **12***a* also for the adhesive layer of area **12***d* in case no additional fastening element **15** is present. Alternatively, the pressure-sensitive adhesive of area **12***d* may be partially detackified to render it less aggressive and removable from the target area **5**.

The area **12***e* which corresponds to the area between the fastening means **15** and the end of the closure tape **10** carrying the finger-lift **16**, usually is at least partly covered with an adhesive layer to reliably secure the finger-lift **16** to the backing **11**. In the embodiment of FIG. **2** the area **12***e* is completely covered with an adhesive layer. The adhesive of area **12***e* may be a pressure-sensitive adhesive or a non-pressure-sensitive adhesive with a pressure-sensitive adhesive being preferred. Especially preferred are the pressure-sensitive adhesives described above for use in area **12***a*. Alternatively the backing **11** in area **12***e* may provide a finger-lift feature if the adhesive in area **12***e* is omitted; in this case no additional finger-lift is required.

The closure tape **10** preferably has a width or extension in cross direction of between 40 and 100 mm and more preferably of between 50 and 80 mm, and an extension in machine direction of preferably between 15 and 50 and more preferably of between 15 and 30 mm. These dimensions are given only by way of example and other dimensions can be used as well. The ratio of the extension in machine direction over the extension in cross direction is preferably between 0.15 and 0.50 and more preferably between 0.25 and 0.40.

The extensions of areas **12***a*–**12***e* are highly variable and may be optimized in view of a specific design of a closure

tape **10** according to the present invention. Area **12***a* corresponding to the manufacturer's end **17** typically has an extension in cross direction of between 10 and 30 mm and more preferably of between 12 and 25 mm. The dimensions of areas **12***b* and **12***d*, respectively, preferably essentially correspond to the dimensions of the elastic sheet **13** and the fastening means **15**, respectively, which are given below. The fastening means **15** can be located directly adjacent to the elastic sheet **13** so that area **12***c* can be omitted. Area **12***c* preferably has an extension in cross direction of between 0 and 20 mm and, more preferably, of between 0 and 15 mm. The extension of area **12***e* may in cross direction preferably is between 0 and 10 and more preferably between 0 and 8 mm. Area **12***e* may be omitted, for example, in case no finger-lift **16** is used or in case a mechanical fastening means **15** is used which simultaneously can provide a finger-lift feature.

The adhesive layer **12** may be present in some or all of the areas **12***a*–**12***e* and/or may be present in additional areas corresponding to further optional features of the closure tape such as, for example, a release liner to cover the adhesive layer of area **12***c*.

The adhesive layer **12** can be applied to the backing **11** using different techniques such as, for example, solvent coating, hot-melt coating, spray coating, slot coating, swirl coating and lamination. Discontinuous adhesive layers can be obtained using different techniques such as, for example, strip coating, lamination or screen printing.

The closure tape **10** comprises an elastic sheet which in combination with one or more incisions (also termed as slits) **14** vertically extending from the surface of the backing **11** through the area **12***b* to the upper surface of the elastic sheet **13**, render the closure tape **10** elastically stretchable in cross direction (CD) thus increasing the fit and the comfort of the absorbent article. In case of mechanical fastening means **15**, the elastic sheet **13** exerts a restoring force onto the joint formed between fastening means **15** and target area **5** which is advantageous in order to reliably secure, for example, the diaper **1** around the wearer's waist. The cross direction which is shown in FIG. **3** corresponds to the longitudinal symmetry axis of the closure tape **10** and is orthogonal to the machine direction (MD, also shown in FIG. **3**) or lateral symmetry axis.

The elastic sheet **13** preferably extends in the machine direction over the full width of the closure tape as is shown in FIG. **3**. It is, however, also possible that the elastic sheet **13** extends only partly over the full width of the closure tape in machine direction and exhibits, for example, a triangular shape. It is also possible, though less preferred, that the extension of the elastic sheet **13** in machine direction is less than the full width of the closure tape over the full length of the elastic sheet in cross direction. The extension in cross direction may be varied depending on the elasticity of the material of the elastic sheet **13** and the number and lateral extension (in machine direction) of slits **14**. For a given elastic material, the extension of the elastic sheet **13** in the cross direction and the number of slits are preferably chosen to provide an elongation of the closure tape **10** in the cross-direction prior to fastening it to the diaper, i.e. in the state shown in, for example, FIG. **2**, of at least 5%, more preferably of at least 7% and especially preferably of at least 10% when applying a force of 15 N in cross-direction during the first elongation. The ratio of the extension of the elastic sheet **13** in the cross-direction over the length of closure tape **10** prior to fastening it to the diaper preferably is between 0.1 and 0.9, more preferably between 0.2 and 0.8 and especially preferably between 0.3 and 0.7. The extension of the elastic sheet **13** is cross direction preferably is between 10 and 40 mm and, more preferably between 10 and 25 mm.

The elastic sheet **13** may be made from a group of materials comprising essentially isotropic or essentially anisotropic materials. Useful elastic materials preferably exhibit an elongation at break as measured according to ASTM D 882 in the preferred direction of stretchability of at least 700% or more and, more preferably, of more than 850%.

Preferred essentially isotropically elastic materials include elastomeric polyurethane materials such as, for example, those available under the trademark ESTANE from B.F. Goodrich & Co., natural or synthetic rubber materials such as, for example, ethylene-propylene-dien copolymers (EPDM), styrene-butadiene-styrene block copolymers (SBS), styrene-(ethylene-butylene)-styrene block copolymers (SEBS) such as, for example, those available from the Shell Chemical Company under the trademark KRATON G like, for example, KRATON G-1657. Other elastomeric materials which may be used to form the elastic sheet **13** include elastomeric polyamide materials such as, for example, those available under the trademark PEBAX from the Rilsan Company and elastomeric polyester materials such as, for example, those available under the trade designation Hytrel from E.I. DuPont De Nemours & Company.

When attaching an essentially isotropic elastic material to the backing **11**, the elasticity of the laminate in the machine direction will be essentially determined by the non-elastic and/or non-extensible, respectively, backing **11**. Therefore essentially isotropically elastic materials can be used for the preparation of the closure tapes **10** of the present invention without rendering it unstable or wobbly in the machine direction.

Preferred essentially anisotropic elastic materials include extruded blends of a block copolymer elastomer portion and a polyolefin polymer portion, respectively, blended in a ratio from 10:1 to 0.4:1, wherein the block copolymer elastomer portion is formed of A blocks and B blocks, the A blocks being predominantly formed of monoalkenyl arenes and the B blocks predominantly of conjugated dienes and wherein the polyolefin polymer portion is comprised predominantly of an inelastic fiber forming polyolefin polymer, copolymer or blend. Such materials are described in copending U.S. patent application Ser. No. 08/720,794 filed by the present applicant on Oct. 4, 1996 now U.S. Pat. No. 5,885,908. JP 51-86,611 discloses extrusion of a blend of an ABA block copolymer with polystyrene where the polymers are exemplified as blended at a ratio of from 50 to 99 percent block copolymer to 1 to 50 percent polystyrene. The resulting material exhibits anisotropic behavior. Other essentially anisotropically elastic materials which are useful in the present invention are described, for example, in U.S. Pat. No. 5,344,691, U.S. Pat. No. 5,501,679 and U.S. Pat. No. 5,354,597.

Anisotropically elastomeric materials which are useful in the present invention preferably exhibit a ratio of the F10 force required to stretch a sheet of the elastomeric material (dimensions 20×25 mm) by 10% into the machine direction over the F10 forces required in the cross direction, of at least 1.5, more preferably of at least 2.0 and especially preferably of at least 2.5.

The elastic sheet **13** can be attached to the backing **11** by the adhesive layer in area **12***b*, and one or more slits or incisions **14** are applied in the area **12***b* extending from the outside surface of the backing **11** through the adhesive layer in area **12***b* to the upper surface of the elastic sheet **13** contacting the adhesive layer.

The extension of the incisions in the cross direction preferably is less than 10 μm, more preferably less than 50 μm and especially preferably between 10 and 30 μm. It was found that if the extension of the slits is less than approximately 25 μm, essentially no adhesive will be squeezed through the slits **14** on stretching and relaxing the closure tape **10** for several times, for example, for 3–5 times, so that the outer surface of the backing **11** remains essentially clean and is not contaminated with adhesive during use. The slits can be obtained by using a cutting wheel **52** as is shown in FIG. **10**. The rotary cutting wheel **52** may comprise 1–8 circular knives separated from each other by typically 1.5–4 mm and results in slits with an approximate width of less than 100 μm and preferably not more than 50 μm. Rotary cutting wheels are commercially available from Dienes Werke, Overrath-Vilkerath, Germany. An example of a useful device is described in Example 1. It is also possible to apply the slits by using an approximately focused beam of a laser, such as, for example, of a CO_2 laser.

In the machine direction, the slits **14** may extend over the full width of the tape as is shown, for example, in FIG. **3**, or over part of the width only as is shown, for example, in FIG. **10**.

When the slits extend over the full width of the closure tape **10** they will open on stretching without deforming or destroying the backing **11** exposing—depending on the construction of the closure tape—essentially rectangular strips of similar width of the adhesive layer of area **12***b* or the elastic sheet **13**, respectively, as is shown in FIG. **3***a*. The elastic response of the closure tape **10** on stretching is essentially determined by the properties of the elastic sheet whereby the force required to obtain a desired elongation essentially depends on the properties of the elastic material, the number of slits extending over the entire width of the closure tape **10** in machine direction (also termed as full slits or incisions) and the density of slits per length unit.

In case the slits extend over part of the width of the closure tape **10** in machine direction (also termed as partial slits or incisions) as is shown, for example, in the configuration of FIG. **9**, they will open on stretching to expose the elastic sheet **13** or the adhesive layer of area **12***b*, respectively, in openings of an essentially hexagonal shape as is shown in FIG. **9***a*. In case of such partial slits, the extension of the openings in the cross direction formed on stretching from slits located at different positions in the cross direction is less regular than in the case of full slits. The slits located in the outer lines of slits are being deformed to a lesser extent whereas the slits in the middle lines are stretched most. The response of the closure tape of FIG. **9** on stretching heavily depends on the properties of the non-elastic and/or non-extensible, respectively, backing **11** and is therefore essentially non-elastic. The bridges of the backing **11** between adjacent openings are irreversibly deformed for low elongations of the closure tape of, for example, approximately 5% or less, and the surface of the backing in the area **12***b* of the closure tape **10** remains rough and uneven on relaxation. Since the inelastic deformation of the backing **11** begins at very low elongations of the closure tape **10** already of, for example, approximately or less than 5%, the force required for initial stretching of the closure tape **10** is essentially determined by the stiffness or tenacity of the backing **11** and therefore usually distinctly higher than the force required for stretching a closure tape comprising at least one full slit by the same elongation.

The closure tapes **10** of the present invention therefore comprise one or more incisions **14** whereby at least one of the incisions extends in machine direction over the full width of the backing in the machine direction. The other slits present can be full or partial slits. Partial slits extending over at least 0.6 and, in particular, at least 0.75 of the full width of the closure tape **10** in machine direction are preferred. In a preferred embodiment of the closure tape **10** of the present invention at least 0.5 and, more preferably, at least 0.7 of the total number of slits are full slits. In an especially preferred embodiment of the closure tape **10** of the present invention, all slits are full slits.

The number of slits is preferably selected to give in combination with the elastic properties of the elastic sheet **13**, the extension of the elastic sheet **13** in cross direction and the extension of the closure tape **10** in cross direction an elastic elongation of the closure tape **10** of the invention to a length of preferably at least 1.15, more preferably of at least 1.20 and especially preferably of at least 1.50 when stretching the closure tape in cross direction with a force of 15 N.

In case of full slits the number of slits preferably is at least 2, more preferably at least 3 and especially preferably at least 5. The density of slits preferably is between 1–10/cm and, more preferably, between 2–7/cm.

In case of partial slits being arranged in configurations like that in FIG. **10**, the number of slits can vary over a wide range and preferably is at least 5, more preferably at least **10** with the density of partial slits being between 1–50/cm and, more preferably, between 1–30/cm.

The slits can be obtained after laminating the elastic sheet **13** to the backing **11** using the adhesive layer in area **12***b*, but the slits can also be obtained prior to laminating the elastic sheet **13** to the backing **11** in case appropriate measurements are taken to retain the physical integrity of the closure tape. FIG. **11** is a schematic representation of a laminator for preparing a laminate which is useful for preparing a closure tape **10** of the present invention. A backing **11** which is continuously or discontinuously covered with an adhesive layer **12** bearing, however, an adhesive layer at least in part of area **12***b* to anchor the elastic sheet **13** (see, for example, FIG. **2** and **8**), is unwound from supply roll **50** and continuously slitted by rotary cutting wheel **52**. An elastic sheet material is unwound from supply roll **33**, and laminated to the slitted backing **11** by bonding roll **54** using the adhesive layer in area **12***b*. The backing **11** is fed to the rotary cutting wheel **52** via roller **51** and kept under tension by bonding roll **54** and roller **55** which is required to hold the strips obtained at the rotary cutting wheel **52** in place. The laminate obtained can then be wound onto storage roll **59**.

The laminate prepared in the process of FIG. **11** comprising a backing **11**, an adhesive layer at least in area **12***b*, an elastic layer **13** and slits **14** in area **12***b* can be processed further to attach a fastening means **15** and, optionally, further features such as, for example, a finger-lift **16**, and can then be wound on a storage roll as a prelaminated closure tape in a stable roll from which the closure tape can be obtained by cutting in cross direction.

The fastening means **15** may comprise mechanical fastening means having engaging elements engagable with their contemplary counterpart on the target area **5**. A suitable closure system comprises two interlocking means, one of them being a hook (or male) fastener means and the other being a loop (or female) fastener means. The fastening means **15** may comprise the hook fastener or the loop fastener means, respectively, but preferably comprises the hook fastener means. The hook fastener means may have any shape such as hooks, "T's" or any other shape as are well known in the art. The hook fastener material may be

manufactured from a wide range of materials including nylon, polyester, polyolefins or any combination of these. A preferred hook material comprises a base and a plurality of engaging elements which comprise a stem supported at the base and an enlarged head which is positioned at the end of the stem opposite of the base. Such material is commercially available as Microreplicated Hook Material of a Mechanical Hook and Loop System, trade designation KN-2396 from 3M Company, St. Paul, U.S.A.

The loop material may be comprised of woven or non-woven fabric or any other suitable material which interlocks with the contemplary hook fastener material. A suitable loop fastening material comprises a number of fiber loops projecting from a woven backing such as the Knitted Loop Tape EKLT-1112, commercially available from 3M Company, St. Paul, U.S.A.

Alternatively, the adhesive layer in area **12***d* may be used as fastening means as was described above.

In a further alternative embodiment, another exposed adhesive layer which may optionally be applied to a carrier sheet, and which is attached to the backing **11** by the adhesive layer of area **12***d*, can be used as fastening means **15**. The exposed adhesive layer is selected to give in combination with the target area **5** the desired adhesion and removability characteristic. The carrier sheet, if present, is selected to permanently bond the exposed adhesive layer to the adhesive layer in area **12***d* and may be selected, for example, from a group of materials comprising polyesters, polyethylenes, polypropylenes, polystyrenes, polycoated papers, polycarbonates or polymethylmethacrylates. The thickness of the carrier preferably is between 20 and 200 μm.

The fastening means **15** preferably has an extension in cross direction of between 10 and 40 mm, and more preferably of between 15 and 30 mm. The fastening means may extend over the full width of the closure tape in machine direction over the full length of its extension in cross direction but other configurations are also possible.

The finger-lift **16** may optionally be attached to the user's end to allow for easier handling of the closure tape **10**. The finger-lift partly covers the adhesive layer in area **12***e*, if present, and has an extension in cross direction of typically between 3 and 10. Alternatively the finger-lift **16** may be attached to the backing **11** by different welding techniques such as, for example, ultrasonic welding. The finger-lift typically has a thickness of between 25 and 200 μm and is preferably prepared from a group of materials comprising polypropylene and polyesters.

DETAILED DESCRIPTION OF THE FIGURES

FIG. **1** shows a partially cutaway perspective representation of a disposable diaper in closed form which is described above.

The details of the closure tape **10** according to the invention are best shown in FIGS. **2–10**.

FIG. **2** shows a preferred embodiment of a closure tape **10** according to the invention having a continuous adhesive layer **12** in areas **12***a*–**12***e* which is attached to a backing **11**. The same adhesive is preferably used in areas **12***a*–**12***e*. The fastening means **15** preferably comprises a mechanical fastening means and, in particular, the hook (male) part of a mechanical closure system. The adhesive layer in area **12***c* provides an additional disposal feature which allows to secure the diaper filled with exudates after use when it is folded or rolled up in a configuration for disposal. The adhesive layer in area **12***c* may be covered with a release liner which is removed prior to use but it is also possible for the adhesive layer in area **12***c* to be exposed throughout use. The finger-lift **16** may extend over the whole area **12***e* to adjoin to the fastening means **15** but part of the adhesive layer in area **12***e* may be exposed, and optionally be covered with release liner.

The fastening surface of the closure tape **10** of FIG. **2** which is reliably and yet removably adhered to the target area **5**, is shown in the bottom view of FIG. **4** whereas the top view of FIG. **3** shows the non-bonding top side of the closure tape of FIG. **2**, in the relaxed state (no tensile force applied). When stretching the closure tape of FIG. **2** in cross direction, the slits split apart forming essentially rectangular opening as is shown in the top view of FIG. **3***a*. The openings exhibit an essentially equal extension in cross direction and are essentially equally spaced from each other.

FIG. **5** shows the closure tape of FIG. **2** being attached to the outside surface **3** of a diaper **1** (peel mode type of attachment). The closure tape is preferably additionally secured by adhering release sheeting **19** carrying adhesive layer **18** onto the inside surface **2** of the diaper as is shown in FIG. **6** (shear mode type of attachment). The adhesive of adhesive layer **18** is preferably selected to permanently bond to the inside surface **2** of diaper **1**. The release sheet **19** is preferably selected to allow for removable adhesion of the adhesive layer of area **12***c* and/or of the fastening means **15**, respectively. Prior to use the closure tape **10** is folded onto the inside surface **2** of the diaper, and adhering the closure tape **10** to the inside surface **2** of the diaper is preferred in order to prevent the closure tape from "pop-open".

FIG. **7** gives a cross-sectional view of the closure tape of FIG. **2** being bent around the edge portion **6** of the diaper **1** to contact the inside surface **2** of the diaper. The diaper is usually stored prior to use and sold in the configuration of FIG. **7**.

A cross-sectional view of an especially preferred embodiment of the closure tape **10** of the invention is shown in FIG. **8**. The elastic sheet **13** is adhered to the backing **11** by small adhesive areas extending from area **12***a* and **12***c*, respectively, into area **12***b* whereas area **12***b* is essentially free of adhesive. The elastic sheet **13** may be additionally secured to the backing **11** by ultrasonic welding or other welding techniques. In the embodiment of FIG. **8** only one full slit may be used because no adhesive layer is present in area **12***b* and the part of the backing between the full slits would break off. Alternatively, it would be possible to use one full slit and several partial slits. Using no adhesive in area **12***b* of the closure tape **10** of FIG. **8** may be advantageous in order to avoid any leaking of adhesive through the slits onto the exposed surface of the backing **11**.

FIG. **9** is a top view of a closure tape having lines comprising partial slits in the area of the elastic sheet **13** in the relaxed state (no tension force applied). In a line, partial slits and bridges between the slits are alternating and the slits of a line face bridges of the adjacent lines. The closure tape of FIG. **9** does not comprise at least one full slit and is therefore not an embodiment of the closure tape **10** according to the present invention. Upon stretching, the slits of the closure tape of FIG. **9** split apart to form essentially hexagonal openings. The extension of the openings in cross direction is distinctly smaller for slits being located in the outer lines as compared to slits in the middle lines (see FIG. **9***a*).

FIG. **10** is a top view of another closure tape **10** according to the invention having one central full slit and a number of partial slits which are arranged to give the configuration of a parallelogram.

FIG. **11** shows a schematic representation of a laminator for preparing a laminate useful for preparing a closure tape **10** according to the present invention. The backing comprising a continuous or discontinuous adhesive layer **12** and at least an adhesive layer in area **12***b* is unwound from supply roll **50** and fed via roller **51** into the rotary cutting wheel **52**. If necessary, the supply roll **50** comprising the backing **11** bearing adhesive layer **12**, may additionally comprise a release liner between the adhesive layer and the previous layer of the backing to facilitate unwinding. Such release liner if present is wound on a storage roll which is not shown in FIG. **10**. The elastic sheet **13** is unwound from supply roll **53** and continuously laminated to the slitted backing **11** via bonding roll **54**.

FIGS. **12** and **13** are hysteresis loss curves recorded for **2** laminates prepared by using the laminator of FIG. **10**. The hysteresis loss curve of FIG. **11** was recorded for a laminate comprising five full parallel incisions arranged in a configuration similar to that of FIG. **3**. This is useful for preparing a closure tape **10** according to the invention. The hysteresis loss curve of FIG. **12** was recorded for a laminate comprising five parallel lines of partial slits arranged in a configuration similar to that of FIG. **9**. The closure tape **10** which is obtainable from this laminate is not an embodiment of the present invention.

The invention will be further explained by the below examples. Numerical values of extensions, widths or lengths given above and below, refer to the relaxed state of the respective material, laminate or closure tape if not indicated otherwise. Before describing the examples a test method is described which is used to characterize the laminate and closure tape **10** of the present invention.

Test Method

Hysteresis Loss Measurement

A laminate which was prepared using the laminator of FIG. **10** and which had an extension in cross direction of 50 mm and in machine direction of 25 mm, was stretched in cross direction using a standard tensile test configuration as described in ASTM D 882 to an elongation of 130% with the extension in cross direction in the virgin state being defined as 100%. The laminate was then relaxed and a second stretching/relaxing cycle was subsequently run. The tensile tester speed was 254 mm/min and the initial tensile force was 0.2 N. The tensile force was measured as a function of the elongation during the virgin and the second test cycle.

EXAMPLES

Example 1

A laminate was obtained using the laminator of FIG. **11**. A synthetic rubber elastic film **13** (sheath/core bicomponent fibers; core: 60% Vector 4211 from Exxon, 40% propylene 7060S from Fina; sheath: 100% propylene 7060S from Fina; sheath/core ratio=1:12, thickness 100 μm, 25 mm wide) was unwound from supply roll **53** and laminated to a pressure-sensitive adhesive tape comprising a propylene backing with a thickness of 110 μm bearing a SIS based pressure-sensitive adhesive which was unwound from storage roll **50** (roll width 50 mm). The adhesive tape is commercially available as Diaper Fastening Tape KE-700 from 3M Company, St. Paul, U.S.A. Prior to lamination in bonding roll **54** the pressure-sensitive adhesive tape was slit in rotary cutting wheel **52**. The rotary cutting wheel was manufactured by Dienes Werke, Overrath-Vilkerath, Germany and comprised 5 circular knives of the type Controlleur (D1=76,96 mm, D2=19 mm, thickness 2 mm, material 1.2067). The resulting laminate exhibited **5** full parallel slits in the area **12***b* of the elastic sheet **13**, the slits having an extension in cross direction of approximately 25 μm and being regularly spaced from each other by 2 mm. The configuration of slits correspond to that shown in FIGS. **3** and **3***a*. The laminate was obtained by unwinding it from storage roll **59** and cutting it in cross direction, thus obtaining laminates 50 mm in cross direction and 25 mm in machine direction.

The laminate was subjected to a hysteresis loss measurement described above, using the test parameters specified above. The hysteresis loss curve recorded is shown in FIG. **12**.

Comparative Example 1

A laminate was prepared using the method of Example 1 using partial slits being arranged in **5** equally spaced lines. The configuration of slits corresponds to that shown in FIGS. **9** and **9***a*. The lines were regularly spaced from each other by 2 mm, and each line had 2 or 3 partial slits with a length of approximately 5 mm. The extension of the slits in cross direction was approximately 25 μm prior to stretching.

The closure tape was subjected to a hysteresis loss measurement described above using the test parameters specified above. The hysteresis loss curve recorded is shown in FIG. **3**.

LIST OF REFERENCES

1—disposable diaper
2—inside surface
3—outside surface
4—absorbent core
5—target area
6—edge portion
10—closure tape
11—backing
12—adhesive layer
13—elastic sheet
14—incisions (also termed as slits)
15—fastening means
16—finger-lift
17—end portion of the closure tape to be attached to the outside surface **3** of the disposable diaper **1** (manufacturer's end)
18—adhesive layer
19—release sheeting
20—support sheet
21—user's end
22—distance between the manufacturer's end **17** and the incisision **14** closest to the manufacturer's end
50—supply roll for the backing bearing the adhesive layer
51, 55–58—roller
52—rotary cutting wheel
53—supply roll for elastic sheet
54—bonding roll
59—storage roll for laminate

What is claimed is:

1. Closure tape (**10**) for an absorbent article, particularly for a disposable diaper (**1**), for fastening of the article on the body of a person, the closure tape being attachable to the outside surface (**3**) of the diaper (**1**) through one of its end portions (**17**) and comprising a backing (**11**) having a first

side and a second side, where the first side is provided with a continuous or discontinuous adhesive layer (12), a fastening means (15) and a stretchable elastic sheet (13) attached to the adhesive layer, the backing (11) being essentially non-elastic and/or essentially non-extensible, the support sheet (20) comprising the backing (11) and the continuous or discontinuous adhesive layer (12) exhibiting one or more incisions (14) in the area of the elastic sheet with at least one of the incisions extending in machine direction over the full width of the backing (11) and the end portion (17) being separated from the incision (14) closest to the end portion (17), by a sufficiently large distance (22) to prevent the incisions (14) essentially from opening when attaching the end portion (17) to the outside surface (3) of the diaper (1) and bending the remaining part of the closure tape (10) to contact the inside surface (2) of the diaper (1).

2. Closure tape according to claim 1 wherein the elastic sheet (13) is selected from a group of materials consisting of elastomeric polyurethanes, natural or synthetic rubbers, elastomeric polyamides or elastomeric polyesters and elastomeric polyolefins.

3. Closure tape according to claim 1 wherein the fastening means (15) comprises a mechanical fastening means and or pressure-sensitive adhesive layer.

4. Closure tape according to claim 1 wherein the backing (11) is selected from a group consisting of kraft paper, cellophane film, polymeric films, non-wovens, foamed materials and laminates.

5. Closure tape according to claim 1 wherein the incisions (14) have an average width in cross direction in the relaxed state of less than 100 μm.

6. Closure tape according to claim 1 wherein the number and extension of the incisions (14) in MD (length) is chosen as to allow for an elongation of a least 15% when applying a force of 20 N in CD.

7. Closure tape according to claim 1 wherein the distance (22) between the end portion (17) and the incision (14) closest to the end portion 17, is at least 2 mm.

8. Closure tape according to claim 1 additionally comprising a release sheeting (19) bearing an adhesive layer (18) to allow for securing the closure tape to the diaper (1) in a shear mode type of attachment.

9. Prelaminated closure tape in a stable roll from which the closure tape for an absorbent article according to claim 1 can be cut.

10. Absorbent article comprising a closure tape according to claim 1.

* * * * *

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United States Patent [19]

Maurer et al.

[11] Patent Number: 5,839,977

[45] Date of Patent: Nov. 24, 1998

[54] APPLIQUE FOR A HOCKEY STICK

[76] Inventors: **Alexander M. Maurer; Richard A. Maurer**, both of 13075 Portsmouth Dr., Carmel, Ind. 46032

[21] Appl. No.: **494,417**

[22] Filed: **Jun. 26, 1995**

[51] **Int. Cl.**[6] **A63B 67/00**

[52] **U.S. Cl.** **473/446**; 473/471; 473/560

[58] **Field of Search** 473/563, 249, 473/250, 351, 352, 324, 329, 330, 331, 342, 334, 132, 189, 195, 190, 431, 361, 363, 471, 514, 235, 416; 273/348.4, 348.5, 412

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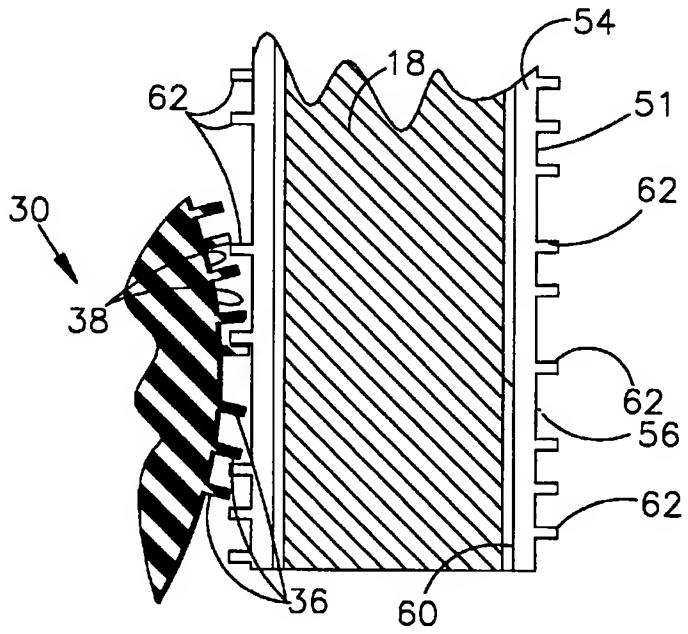
Primary Examiner—Theatrice Brown

Attorney, Agent, or Firm—Bose McKinney & Evans

[57] **ABSTRACT**

An applique is disclosed for placement on a hockey stick for improving the engagement of the stick with a game piece. The applique includes a base member having a first surface and a second surface. An adhesive is provided on a second surface for adhesively attaching the second surface to the stick. An ordered array of substantially non-deforming protrusions or recesses are formed on the first surface for engaging a surface of a game piece, such as a hockey puck. The protrusions are designed to maximize the frictional engagement between the applique and the puck, to increase the user's ability to control the puck. In an alternate embodiment, an applique is disclosed having a series of direction influencing protrusions formed on the first surface for influencing the direction of deflection of the hockey puck off the first surface toward a predetermined direction. Protrusions are disclosed for use on a goalie's hockey stick to drive the puck downwardly toward the ice or street to aid the goalie in controlling the puck. Alternate protrusion types are also provided for use on a forward's stick, to influence the direction of deflection of a puck on the stick in a lift or spin when the puck is being handled or shot by the forward. In an alternate embodiment, an improved grip applique is provided, which is attachable to the handle of the stick to increase the user's ability to achieve consistent placement of his hand on the stick.

15 Claims, 7 Drawing Sheets



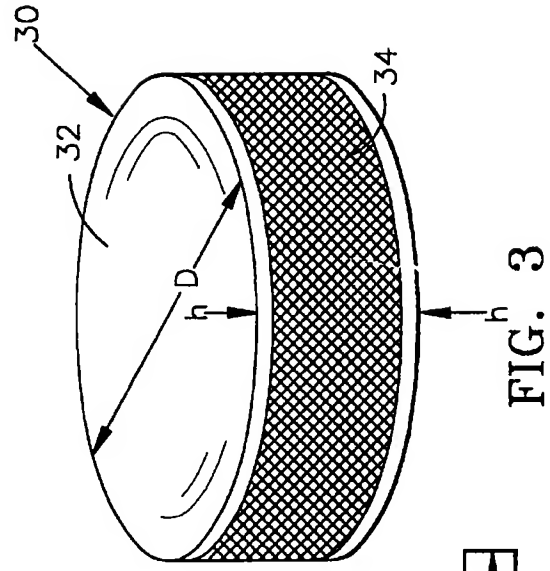


FIG. 3

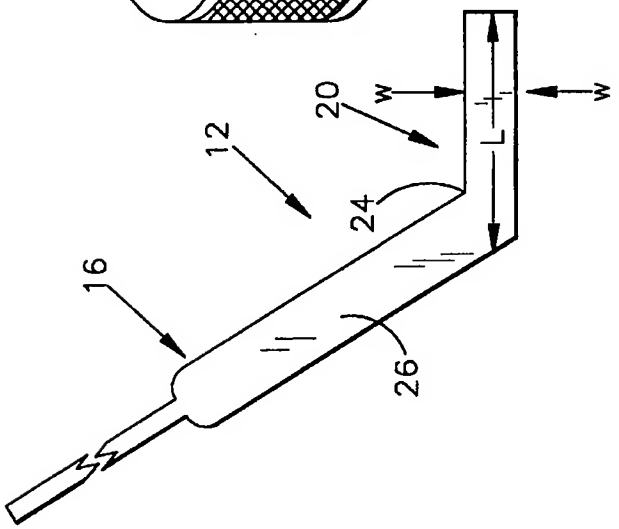


FIG. 2

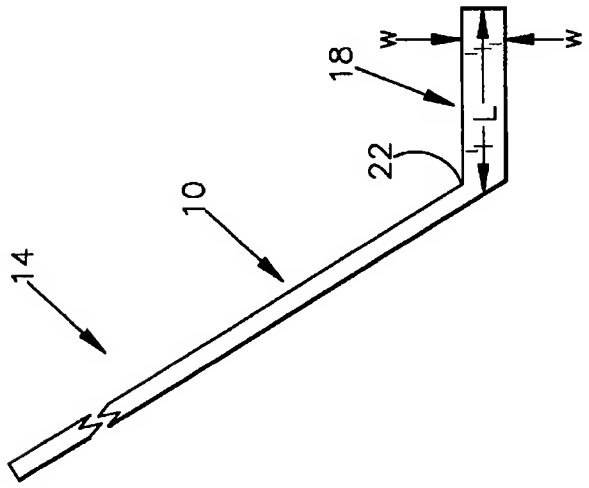


FIG. 1

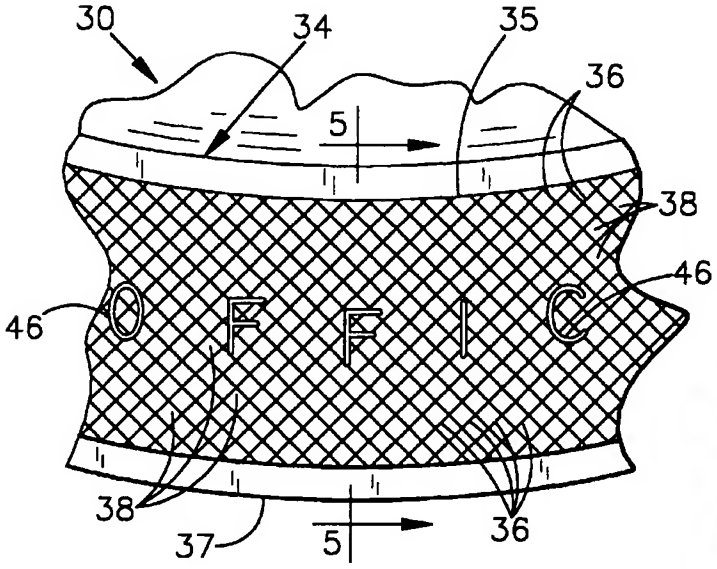


FIG. 4

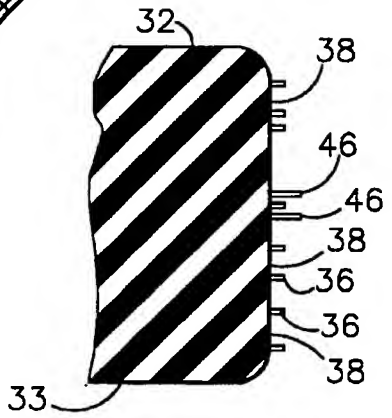


FIG. 5

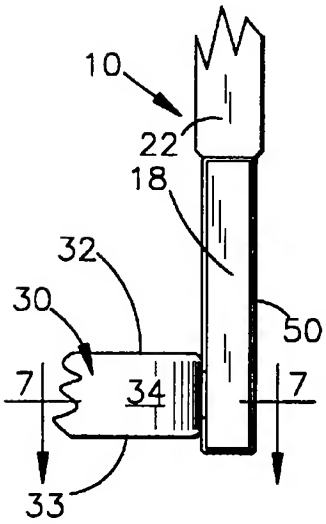


FIG. 6

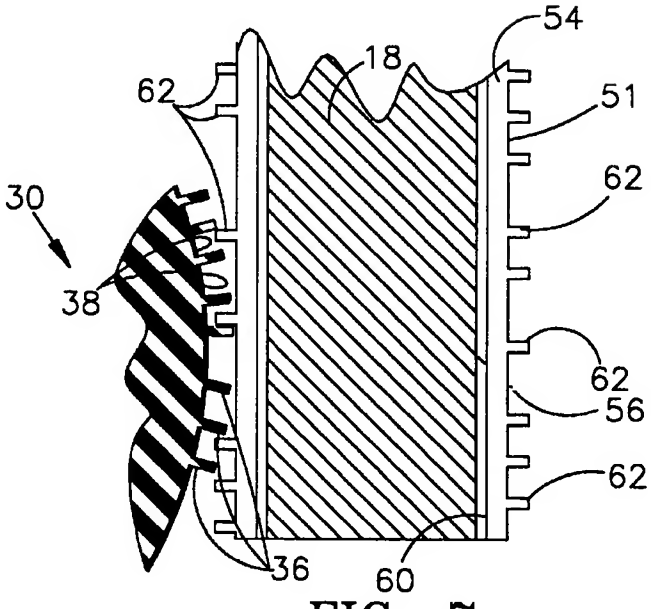


FIG. 7

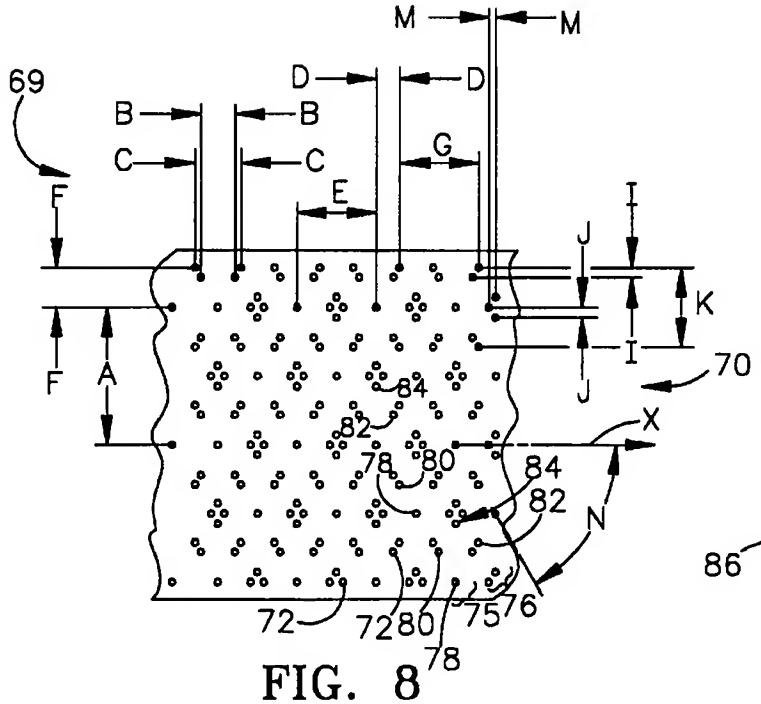


FIG. 8

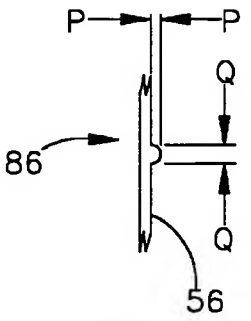


FIG. 9

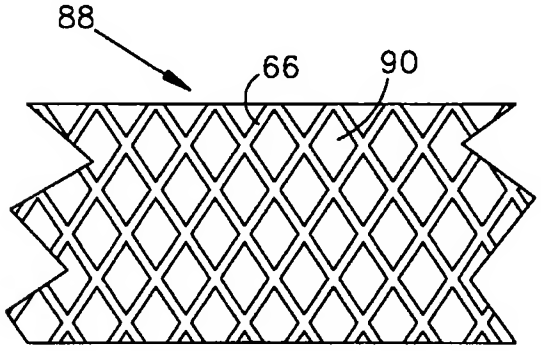


FIG. 10

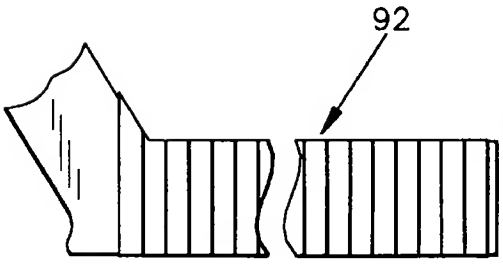


FIG. 11

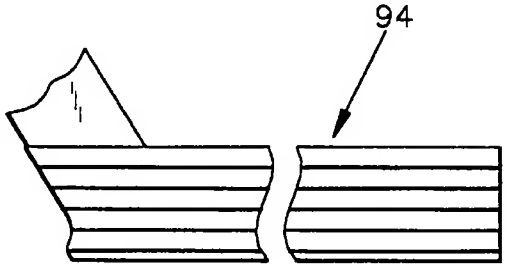


FIG. 12

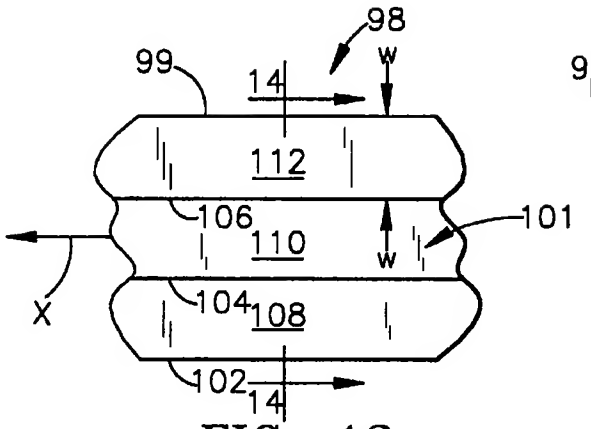


FIG. 13

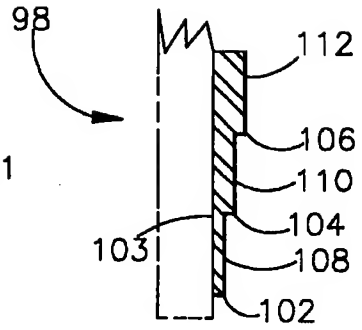


FIG. 14

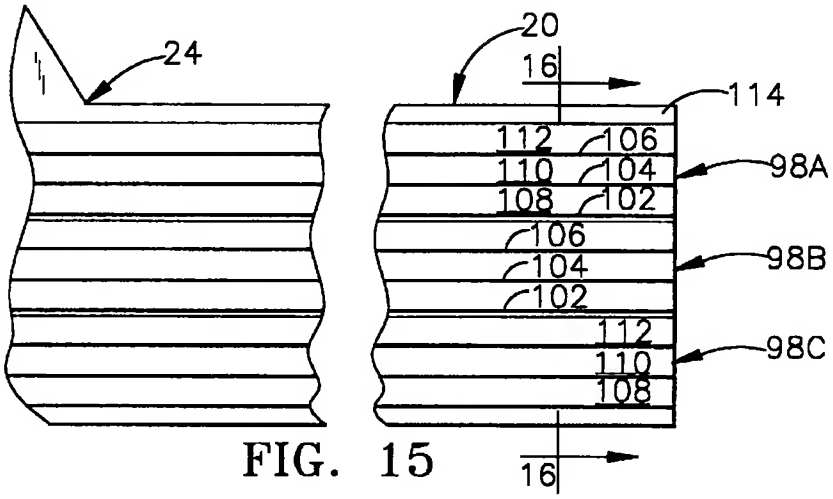


FIG. 15

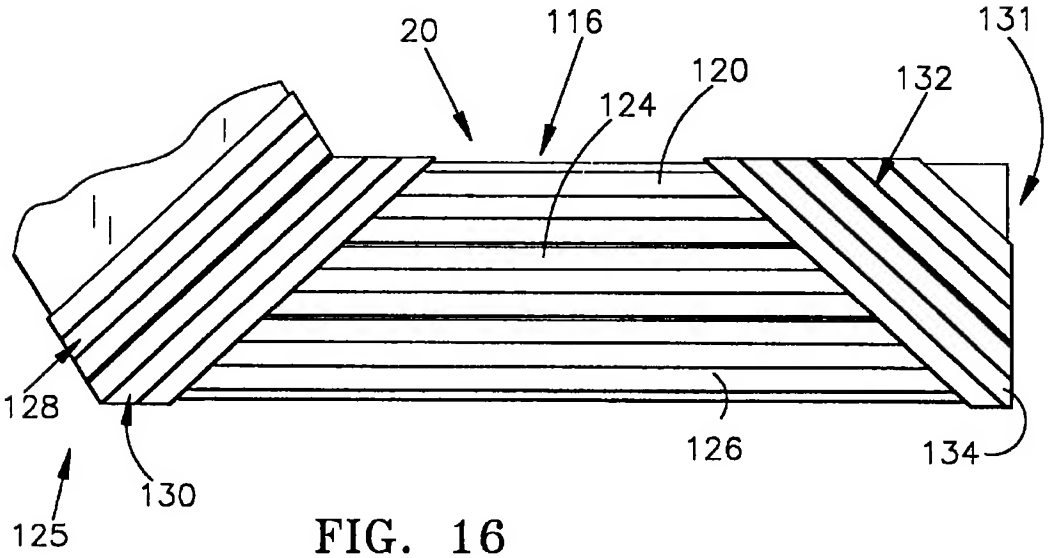


FIG. 16

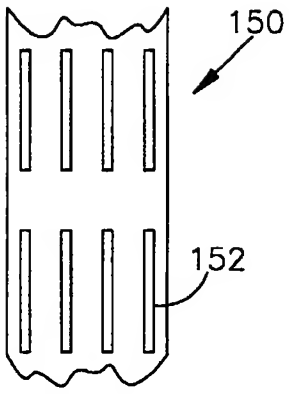


FIG. 17

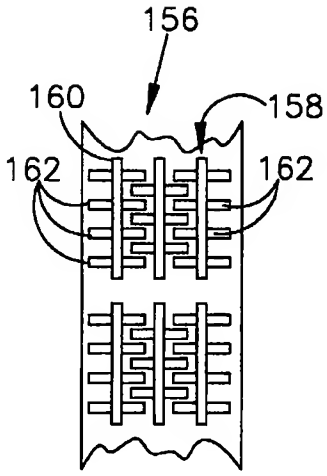


FIG. 18

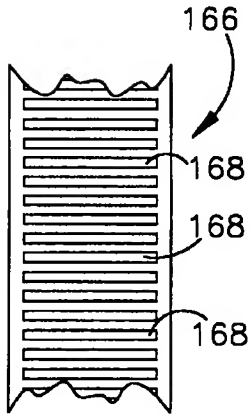


FIG. 19

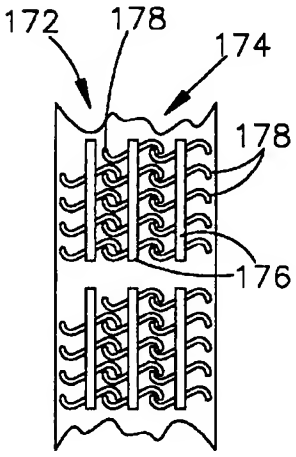


FIG. 20

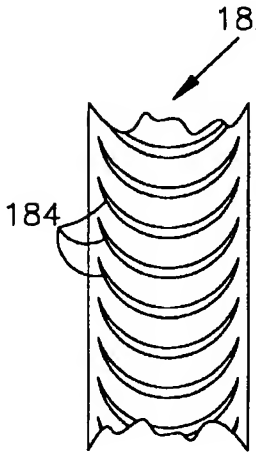


FIG. 21

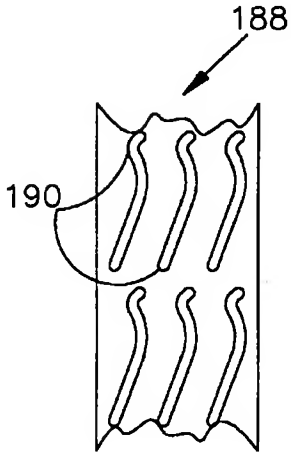


FIG. 22

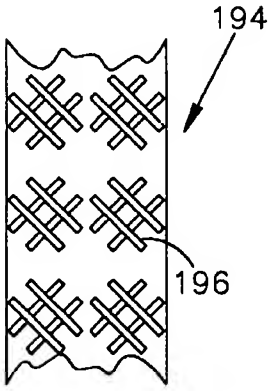


FIG. 23

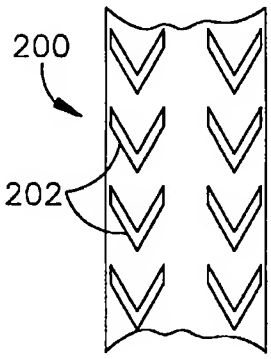


FIG. 24

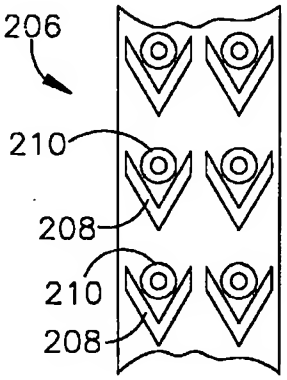


FIG. 25

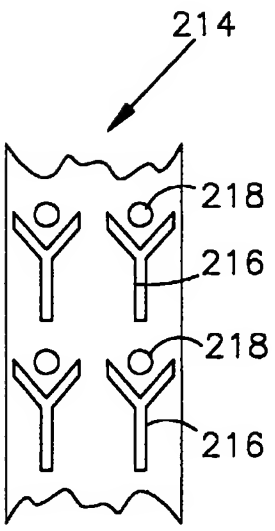


FIG. 26

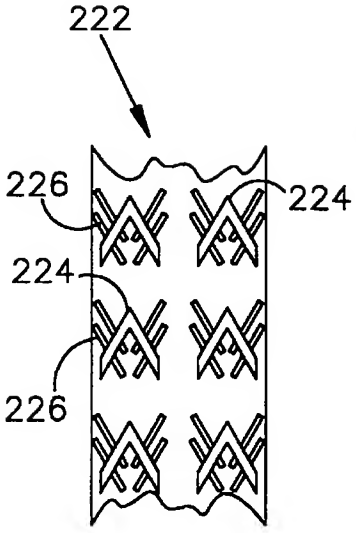


FIG. 27

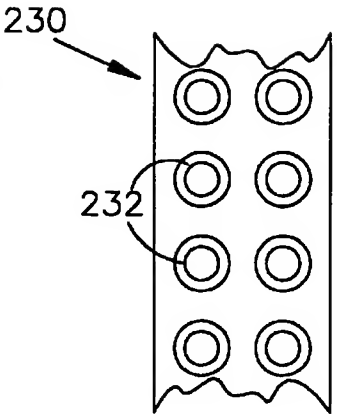


FIG. 28

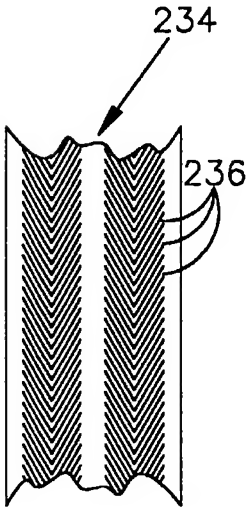


FIG. 29

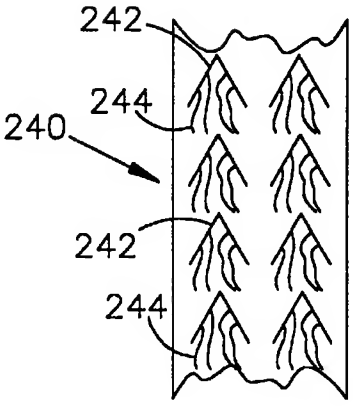


FIG. 30

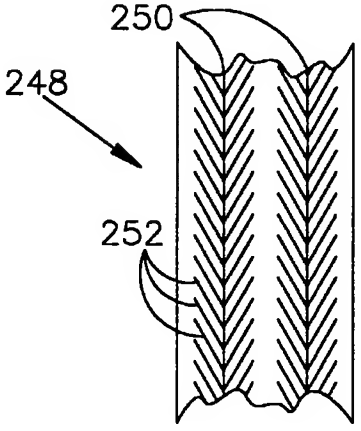


FIG. 31

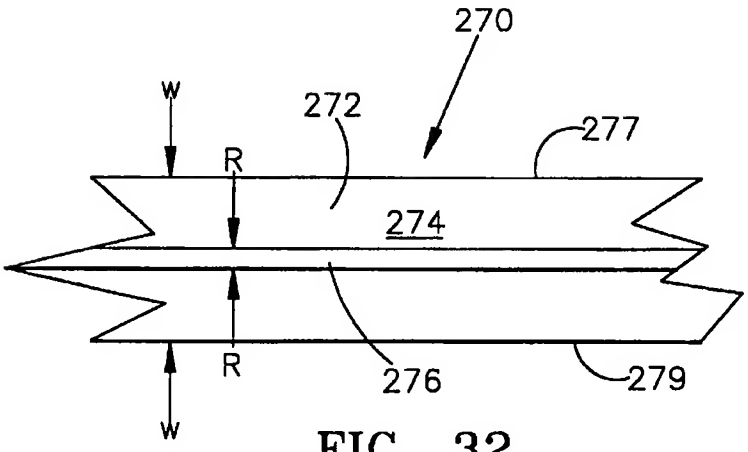


FIG. 32

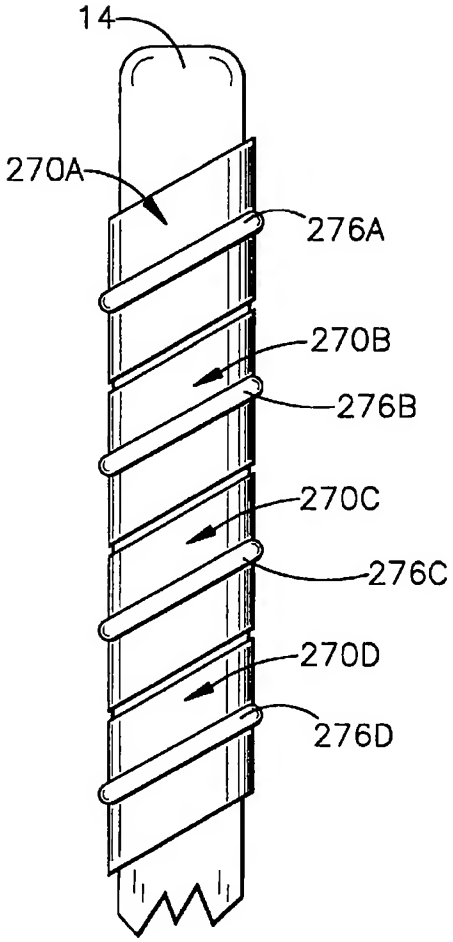


FIG. 33

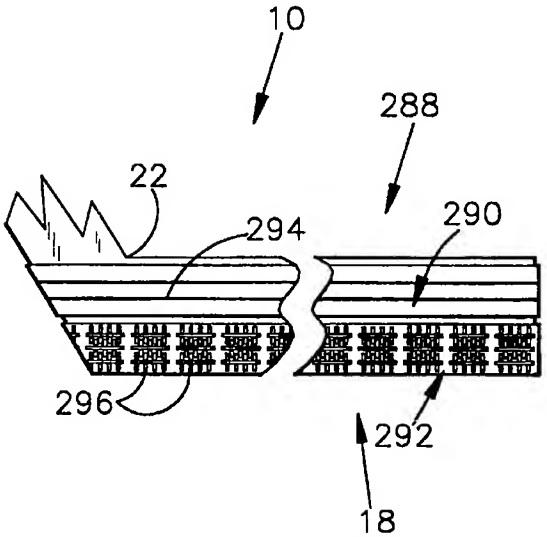


FIG. 34

APPLIQUE FOR A HOCKEY STICK

I. TECHNICAL FIELD OF THE INVENTION

The present invention relates to sport equipment, and more particularly to an applique for use on a hockey stick for enhancing the user's ability to control a game piece, such as a hockey puck or hockey ball, with the hockey stick and to improve the user's ability to grip the hockey stick.

II. BACKGROUND OF THE INVENTION

For years, hockey type sports have been enjoyed and played by people throughout the world. Although ice hockey is the best known form of hockey played currently in the United States, other types of hockey exist, such as field hockey, and "street" or "in-line hockey" which is played using in-line roller skates or traditional roller skates, rather than blade bearing skates.

Although many variations in the sport exist, the common denominator which unites the potential users of the present invention is the "hockey stick". As used in this application, "hockey stick" refers to any stick or bat-like object that includes a handle portion that is gripped by the user at one end, and has a ground-engageable blade disposed at the other end.

Examples of known hockey sticks are shown in FIGS. **1** and **2**. Stick **10** of FIG. **1** is a type of stick typically used by wings, centers and defensemen on a ice hockey team. Because wings, centers and defensemen use the same type of stick and use their sticks to perform generally similar functions, wings, centers and defensemen will be referred to collectively in this application as "forwards," and the hockey stick type typically used by them as "forward's sticks" **10**. FIG. **2** shows a goalie's stick **12** which is used by a goalie on a hockey team. Each of the forward's hockey stick **10** and the goalie's hockey stick **12** includes a handle portion **14, 16**, a ground-engaging blade **18, 20** and a "heel" or "shank" portion **22, 24**, respectively. The shank portion **22, 24** is the area of the hockey stick where the respective handles **14, 16** join to the respective blades **18, 20**.

The forward's hockey stick **10** and the goalie's stick **12** are generally similar. However, it will be noted that the length L and the width W of the blade of the goalie's hockey stick **12** are typically larger than that of the forward's stick.

For quite some time, it has been common practice to wrap a multi-purpose cloth tape around the blade of a hockey stick and the handle of the hockey stick. The multi-purpose cloth tape typically used is virtually identical to the tape used by some baseball players to wrap their bats and by some cyclists to wrap their handlebars. Originally, the primary purpose of wrapping the blade was to reinforce the blade to help prevent it from breaking when it struck a puck or the ice to thereby lengthen the useful life of the blade.

Several patents are known which disclose devices that seek to improve on the reinforcing qualities of tape by using alternative methods to strengthen the blade.

Diederich U.S. Pat. No. 4,172,594 discloses a hockey stick having a wooden blade, whose surface is reinforced with a fiberglass impregnated resin coating. Tape can then be placed over this coating.

Profit U.S. Pat. No. 4,651,990 relates to a hard plastic channel member that fits over the blade of a goalie's hockey stick to provide reinforcement for the blade. The channel member is overlain with tape to provide a control surface.

Franck U.S. Pat. No. 4,448,721 relates to a hockey stick made by an injection molding technique. The blade may include series of apertures that reduce the weight of the core. A pre-preg material (such as a kevlar/epoxy material) is molded around the core to provide additional strength to the blade.

Goupil, et al. U.S. Pat. No. 4,084,818 discloses a hockey stick having a blade that is overlain with fiberglass yarn, which is wrapped around the blade. The fiberglass yarn is then dipped into an epoxy bath. The epoxy bath dipped blade is then left to dry and harden for 24 hours.

Traverse U.S. Pat. No. 3,353,826 discloses the use of a tubular sock which is knitted of a strong yarn of nylon or fiberglass, together with very fine nylon filaments. The sock is sized to fit smoothly on the blade, and onto a few inches of the shank of the stick, when tightly stretched. Liquid plastic is then applied to the portion of the stick covered by the sock so as to imbed the sock and form a top coating thereon.

Many advances, such as those described above have found their way into currently manufactured hockey sticks. Most currently manufactured hockey stick blades include some sort of plastic, fiberglass or KEVLAR® coating to help strengthen the blade to prevent it from breaking. Alternatively, other sticks are designed with tubular aluminum handles having an open end into which the shank of a blade can be fitted, so that a broken blade can be removed from the handle, and a new blade inserted into the handle, so that the handle may be reused indefinitely.

In view of these advances, broken blades have become much less of a problem, and hence the need for tape to reinforce the blade to provide additional mechanical strength is greatly reduced. Most currently manufactured blades appear to have sufficient mechanical strength so as to make blade breaks a rarity.

The second function performed by the multi-purpose tape is to aid the user in puck control. As the wooden or fiberglass surface of a hockey blade typically has a lower coefficient of friction then the surface of adhesive cloth multi-purpose tape, the placement of tape on the blade of the stick tends to increase the coefficient of friction of the blade, which provides the blade with a "grippier" surface than an unwrapped blade. This "grippier" surface helps the hockey player to better maintain the puck on the stick when the player is catching the puck, advancing the puck, shooting the puck, or passing the puck.

Several known items of prior art exist that address this need for providing the blade of a hockey stick with an improved control surface.

Spratt Canadian Patent No. 984,420 discloses a hockey stick having a blade to which an adhesive is applied. While the adhesive is still wet, a grit material (e.g., sand) is then applied to the adhesive to provide a gritty surface to the stick.

Coles U.S. Pat. No. 3,458,194 discloses the use of a tape material having an adhesive side for attaching to a stick, and an outer surface comprised of a Velcro-like material. The purpose of this Velcro-like material is to improve the control of the puck on the blade.

Susi, et al. U.S. Pat. No. 5,332,212 relates to the use of a rubbery (soft plastic) coating for a hockey blade that is applied to the blade through an immersion or aerosol spray technique.

Gardner, et al. U.S. Pat. No. 2,912,245 discloses a hockey stick having a rubber coating molded onto the blade to simulate a tape surface. The rubber coating is applied by a molding process, wherein a strip of uncured rubber is laid on

face of the mold. The blade is then laid upon the strip of uncured rubber. A second strip of uncured rubber is laid upon the blade. The mold is then closed with both faces of the mold being provided with ridges for molding ridges into the first and second strips of uncured rubber. The blade and the sides of the two strips of uncured rubber may be provided with an adhesive. After the mold is closed, it is subjected to a 300° F. temperature and between 3 and 5 tons of pressure for a duration of between about 3 and 3.5 minutes. The rubber strip is cured during this molding process.

Although the above discussed, Sprat, Coles, Susi, and Gardner references do address the issue of providing a surface on a hockey blade which seeks to improve over known cloth adhesive type multi-purpose tape, room for improvement still exists. In particular, the need still exists for providing a surface for a hockey stick that provides a user with a greater degree of control than that disclosed in any of the references described above. Additionally, there is a need for an improved control surface for a hockey stick blade that can be applied to the blade by the user in a manner that is familiar to the user and is similar to the manner in which the user currently applies tape to the blade.

It is therefore one object of the present invention to provide an applique which creates an improved control surface on a hockey stick blade, and which can be applied to the hockey stick blade by the user, in a manner similar to the manner in which adhesive tape is currently applied to hockey blades and without the need for adhesive sprays, grit applicators, curing molds, or other non-user friendly application techniques.

Another deficiency of the devices discussed above, and conventional hockey tape is that they provide a generally "neutral" stick surface, which does not tend to influence the angle at which a puck deflects off of the surface of the stick. Although a neutral deflection is preferred in many situations, a need also exists for a surface that will tend to influence the angle of deflection of the puck to thereby impart better directional predictability.

Therefore, it is also an object of one embodiment of the present invention to provide a surface for a hockey stick blade that helps to influence a puck striking the surface to deflect from the surface in a predetermined direction.

A further deficiency with current known hockey sticks is that few provide a completely suitable gripping surface on the handle of the stick. In order to provide a better gripping surface for the user, most hockey players currently wrap the end of the handle of the stick with a multi-purpose cloth adhesive tape, which is usually the same tape used by the player to wrap the blade of the stick. In a manner similar to the manner in which it functions with the blade, the application of a multi-purpose adhesive tape to the end of the handle increases the co-efficient of friction of the wrapped portion of the handle, which thereby helps the user's gloved hand to hold onto the stick better. Those familiar with the large, somewhat cumbersome protective gloves worn by hockey players will appreciate the difficultly that a player often has holding onto a stick with his gloved hand.

Although the application of a multi-purpose tape to the handle does provide a benefit to the player, as it helps the user to increase the frictional engagement between his glove and the handle of the stick, room for improvement exists. In particular, room for improvement exists in providing a grip that not only provides the user with a relatively high degree of frictional engagement between his hand and the handle of the hockey stick, but also helps to position his fingers consistently on the stick. It is therefore another object of the present invention to provide an applique for use on the handle of a hockey stick which both improves the user's ability to grip and retain the stick, and also improves the user's ability to obtain a consistent placement of his hand on the handle of the stick.

III. SUMMARY OF THE INVENTION

In accordance with the present invention, an applique is provided for placement on a hockey stick for improving the engagement of the stick with a game piece. The applique comprises a base member having a first surface and a second surface, and means for adhesively attaching the second surface to the stick. An ordered array of substantially non-deforming protrusions are formed to extend above the first surface for engaging the surface of a game piece.

Preferably, the protrusions are generally hemispherical in shape, and are sized for engaging recesses formed in the surface of the game piece, such as the diamond shape recesses typically found along the side surface of a hockey puck. The hemispherical protrusions are sized and positioned to maximize the probability of the insertion of the protrusions of the applique into the recesses of the puck, to maximize engagement of the puck and stick and thereby provide an enhanced coefficient of friction therebetween.

In an alternate embodiment of the present invention, the ordered array of protrusions are replaced with an ordered array of recesses formed in the base member, to extend below the first surface for engaging protrusions on the side surfaces of the puck.

In another alternate embodiment, an applique is provided for placement on a hockey stick for improving the engagement of the stick with a game piece. The applique comprises a base member having a first surface and a second surface and means for adhesively attaching the second surface to the stick. Direction influencing means are disclosed on the first surface for influencing the direction of deflection of the game piece off the first surface, toward a predetermined direction.

In still yet another alternate embodiment, an applique is provided for placement on a hockey stick for improving the user's grip of the stick. The applique comprises a base member having a first surface and a second surface, and a means for adhesively attaching the second surface to the stick. A longitudinal ridge member is formed to extend above the first surface. Preferably, the size and position of the ridge member are chosen so that when the applique is wrapped around the stick in a side-by-side relation, the ridge members of adjacent portions of the applique provide sufficient room to receive a user's finger therebetween.

One feature of the present invention is that it contains an ordered array of substantially non-deforming protrusions, that are formed to extend above the outer surface of the applique for engaging a surface of a game piece. Preferably, the protrusions are sized and positioned to maximize the engagement of the protrusions with recesses formed in the surface of a game piece, such as a hockey puck. This feature has the advantage of increasing the degree of frictional engagement between the stick blade and the game piece. This increased frictional engagement helps the player to better maintain the puck on the stick, thereby giving to the player an enhanced ability to control the puck on the stick. Additionally, this enhanced frictional engagement can increase the ability of the user to spin or lift the puck when shooting the puck.

Another feature of a preferred embodiment of the present invention is that an applique is provided having direction

influencing means disposed on the surface for influencing the direction of deflection of the game piece off the stick toward a predetermined direction. This feature has the advantage of enabling the user to better direct the puck in an intended or desired direction and to reduce the likelihood that the puck will travel in an unintended or undesired direction.

The issue of what constitutes a "desired direction" will likely vary among types of players (e.g, goalies and forwards) and may also vary from player to player based on individual preferences and circumstances. However, several common preferred directions exist. For goalies, it is desirable to influence a puck to deflect downwardly off a stick blade toward the ice. By directing the puck downwardly, it will engage the ice, and preferably stop only a short distance in front of the goalie, so that the goalie can retrieve it.

It is usually undesirable for a goalie to deflect the puck upwardly. An upwardly deflected puck is more difficult for the goalie to control, and hence, stands a greater likelihood of being controlled by an opposing player. Additionally, a puck which is deflected upwardly may continue in its same direction of travel, and thereby cause the goads to) lose control of the puck. As such, the applicants have found that, for goalies, it is preferable to influence the puck to deflect in a downward direction, and undesirable to deflect the puck in an upward direction.

Preferably, the direction influencing means also increases the applique's ability to absorb energy from the puck, thus reducing its deflection energy off of the stick, and hence reducing the distance that the puck will travel off the blade after striking it.

Different considerations exist with respect to the direction in which a forward, such as a wing, center, or defenseman, may wish to deflect a puck. As a forward is often using his stick to advance the puck toward the opponent's goal, he may wish to use a control surface that will cause the puck to behave in a manner that makes it difficult for an opponent, such as the opponent's goalie, to stop it. As a general rule, most goalies find it more difficult to stop an airborne puck than one which is traveling along the surface of the ice. Additionally, it is often desirable to lift the puck off the ice as a lifted puck that is traveling through the air tends to maintain its speed better, and is less likely than one traveling along the ice to slow down through frictional engagement with the ice. As such, a forward may wish to have a control surface on his stick that influences the puck to deflect upwardly when shot, and thereby lift off the ice.

Additionally, many players might prefer to have a control surface which influences the puck to "spin" when hit, as a spinning puck tends to travel more accurately than a non-spinning puck, thus increasing the likelihood that the player shooting a spinning puck will score when the puck is shot on goal.

As a third alternative, some players may desire that the control surface influence the puck to bounce downwardly toward the ice, as this type of deflection would help to enable the player to maintain a better control of the puck as he advances it down the ice or attempts to pass it to one of his teammates.

It is a further feature of the present invention that the direction influencing means can include two or more series of direction influencing means for providing two or more zones on the stick, with each zone having a pattern thereon to influence the puck in a different direction. This feature has the advantage of enhancing the player's ability to control the puck by enabling the stick to improve several facets of the player's control of the puck. For example, a player may wish to have a first zone near the top of the blade that influences the puck to deflect downwardly toward the ice. This downward deflection would help the player to control the puck when he was receiving airborne passes from his teammates or otherwise trying to gain control of an airborne puck when taking it away from an opponent. However, he may also wish to have a direction-influencing pattern on the bottom portion of his stick that would cause the puck to lift and spin when he was shooting the puck. In such case, the user may prefer a direction-influencing applique having a pair of zones, each of which is intended to influence the puck to travel in a different direction.

It is also a feature of one embodiment of the present invention that an applique is provided for placement on a hockey stick handle for improving the user's grip on the handle of the stick. This feature has the advantage of giving the user a more secure grip, which helps to prevent the user's hand from sliding up and down the length of the stick during use. Additionally, the grip helps to position the player's hand more consistently, to enable the player to grip the stick in a more consistent position, thus aiding the player in his stick control and ability to control the game piece with the stick.

Additionally, it is a further feature of the present invention that the applique is preferably made from a relative "soft durometer" polyvinyl chloride (PVC) material. The use of this PVC material has the advantage of making the applique water repellent, and helps to make the blade "softer," thus giving the player better "feel" and better control over the puck.

These and other features of the present invention will become apparent to those skilled in the art upon review of the drawings and detailed description set forth below of that which is perceived presently to be the best mode of practicing the invention.

IV. BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side plan view of a forward's hockey stick;

FIG. **2** is a side plan view of a goalie's hockey stick;

FIG. **3** is a perspective view of a hockey puck;

FIG. **4** is an expanded view of a portion of a side surface of a hockey puck;

FIG. **5** is a sectional view taken along lines **5—5** of FIG. **4**;

FIG. **6** is an end view of a hockey stick and blade, and side view of a puck in engagement therewith;

FIG. **7** is a sectional view taken generally along lines **7—7** of FIG. **6**;

FIG. **8** is a greatly enlarged, largely schematic view of a protrusion pattern of the present invention;

FIG. **9** is an even further enlarged side view of a single protrusion of the pattern shown in FIG. **8**;

FIG. **10** is a top view of a segment of an alternate embodiment applique of the present invention;

FIG. **11** is a side view of a hockey stick showing a "top to bottom" wrapping pattern;

FIG. **12** is a side view of a hockey stick showing an alternate, side-to-side wrapping pattern;

FIG. **13** is a top view of an alternate embodiment applique of the present invention;

FIG. **14** is a sectional view taken generally along lines **14—14** of FIG. **13**;

FIG. **15** is a side view of a hockey stick blade showing the applique of FIG. **13** thereon;

FIG. **16** is an side view of a hockey stick blade containing the applique of FIG. **13** showing an alternate wrapping pattern;

FIG. **17** is a top view of a segment of an alternate embodiment applique;

FIG. **18** is a top view of a segment of an alternate embodiment applique;

FIG. **19** is a top view of a segment of an alternate embodiment applique;

FIG. **20** is a top view of a segment of an alternate embodiment applique;

FIG. **21** is a top view of a segment of an alternate embodiment applique;

FIG. **22** is a top view of a segment of an alternate embodiment applique;

FIG. **23** is a top view of a segment of an alternate embodiment applique;

FIG. **24** is a top view of a segment of an alternate embodiment applique;

FIG. **25** is a top view of a segment of an alternate embodiment applique;

FIG. **26** is a top view of a segment of an alternate embodiment applique;

FIG. **27** is a top view of a segment of an alternate embodiment applique;

FIG. **28** is a top view of a segment of an alternate embodiment applique;

FIG. **29** is a top view of a segment of an alternate embodiment applique;

FIG. **30** is a top view of a segment of an alternate embodiment applique;

FIG. **31** is a top view of a segment of an alternate embodiment applique;

FIG. **32** is a top view of a segment of an grip-enhancing applique of the present invention;

FIG. **33** is a front view of a handle of a hockey stick showing the applique of FIG. **32** wrapped there around; and

FIG. **34** is a side view of an alternate embodiment wrapping pattern, for creating an applique having two distinct zones for influencing the direction of deflection of a puck.

V. DETAILED DESCRIPTION

Turning now to FIGS. **1–3**, hockey sticks **10**, **12** and a hockey puck **30** are shown which are integral to the understanding of the applique of the invention.

FIG. **1** shows a forward's hockey stick **10** of the type normally used by a defenseman, wing, or center. The forward's hockey stick has a handle portion **14** and a blade portion **18**. According to current ice hockey equipment rules, the blade **18** of the forward's hockey stick **10** can have a width W—W of between 2 and 3 inches, and a length L—L of less than 12.5 inches. A forward's hockey stick also includes a shank (heel) portion **22** which comprises that area wherein the blade **18** meets the handle **14**.

The goalie's hockey stick **12** includes a handle **16**, a blade **20** and a shank portion **24**. According to current ice hockey equipment rules, the goalie's stick **12** can have a blade **20** having a maximum width W of less than 3.5 inches, and a length L of less than 15.5 inches. The widened lower portion **26** of the handle **16** is used by the goalie to help block pucks.

For in-line skate ("street") hockey events, forward's sticks and goalie's sticks similar to those shown in FIG. **1** and **2** are used. For events sanctioned by one sanctioning body (USA HOCKEY IN-LINE), the dimensions used for street hockey sticks are identical to those for ice hockey sticks. However, for events sanctioned by another sanctioning body (THE NATIONAL IN-LINE HOCKEY ASSOCIATION (NIHA)), different dimensions are specified. For NIHA events, the forward's stick may have a blade having a length of less than 12 inches, and a width of between 1.75 and 3.25 inches. A goalie's street hockey stick may have a blade having a length of less than 15.5 inches and a width of less than 3.5 inches. Additionally, some models of forward's in-line hockey sticks also include a horizontally extending array of holes disposed across the upper portion of the blade of the stick.

Although the applique of the present invention can be applied to a hockey stick (e.g., 10, 12) and used with any game piece, such as a ball of some sort, the most common game piece is a puck, such as hockey puck **30**. Hockey puck **30** is a disk-shaped solid, vulcanized rubber game piece having a circular top surface **32**, a circular bottom surface **33** (FIG. **5**) and a cylindrical sidewall **34**. The diameter D of each of the circular top surface **32** and bottom surface **33** is preferably about 3 inches. The cylindrical sidewall has a height, H—H (FIG. **3**) of approximately 1 inch.

As best shown in FIGS. **4** and **5**, the cylindrical side surface **34** has a cross-hatched pattern of raised ridges **36** that define a series of diamond-shaped recesses **38** therebetween. A pair of circumferential ridges **35**, **37** extend circumferentially around the side surface **34** of the puck **30**, and are disposed at the border of patterned areas to define the boundary of the patterned area of side surface **34**. Although almost all hockey pucks have this pattern of ridges **36** and diamond-shaped recesses **38**, the sizes of the ridges **36** and recesses **38** vary from manufacturer to manufacturer. The applicant knows of at least three different sized patterns used currently. Known hockey pucks that are manufactured in Czechoslovakia have a ridge **36** and recess **38** pattern which contains **32** recesses **38** per inch in a height dimension (e.g., along lines H—H of FIG. **3**), and **28** rows of recesses **38** per inch in a circumferential direction. Comparable pucks made in Canada and Slovakia, by contrast, contain **24** recesses per inch in a height dimension H—H, and **20** recesses per inch in a circumferential direction. Additionally, certain pucks known to the applicant that are made in China have a pattern containing **20** recesses per inch when measured in a height direction H—H, and **20** recesses per inch when measured in a circumferential direction.

These spacing differences create recesses in the different types of pucks, which have slightly different shapes and sizes. These differences in the shape and size of the recesses add to the challenge of designing an applique that will work well with all of the different types of pucks and their different cross-hatched pattern configurations.

As best shown in FIGS. **4** and **5**, most hockey pucks **30** include secondary protrusions which are sized and shaped differently than the protrusions **36** formed by the cross-hatched pattern. These protrusions primarily comprise letters **46**, such as the letters "O-F-F-I-C" shown in FIG. **4**. These letters **46** have a different shape and position than the cross-hatched ridges **36**. As best shown in FIG. **5**, these secondary protrusions **46** also tend to have a greater height than the cross-hatched ridges **36**, and thus stick out further from the side surface **34** of the puck **30**.

As best shown in FIG. **6**, the applique **50** is designed to be placed on the blade **18** of a hockey stick, to enhance the user's ability to control the puck **30** with the blade **18**, by

maximizing the frictional engagement between the blade **18** and the puck **30**. As a result of this enhanced frictional engagement, the user is better able to spin, lift and control the puck **30**.

The applique **50** can take on a variety of forms. Preferably, the applique **50** comprises a ribbon-like base member **54** having a first surface **56** and a second surface **60**. The applique **50** of the present invention can be generally similar in size, shape and flexibility to currently used multi-purpose cloth tapes, and can be provided in a roll, similar to the rolls in which tape is currently provided. Preferably, the applique (in its roll-tape form) has a width of about 0.75 inches, and is formed into rolls having a length per roll of between about 4 and 20 yards in length. Because of the formed surface features (discussed below) of the applique **50**, it will likely have a thickness which is slightly greater than conventional roll tapes. The applique **50** can be manufactured in a variety of colors.

Alternately, the applique **50** can be provided as a "patch" format that is manufactured on a sheet, and then is applied in one piece over the front, back (or both) faces of the hockey stick blade. The patch form of the applique **50** would be especially useful in conjunction with the "multi-zone" applique **288** shown in FIG. **34**, and would also be useful to provide the application configuration **116** shown in FIG. **16**.

As most current hockey blades include fiberglass reinforcement, the tape need not be wrapped around the blade to provide additional reinforcement, as this additional reinforcement is unnecessary. As such, the applique **50** of the present invention can be applied only to one face of the blade if so desired, such as by placing the applique **50** in its "patch" form on only one face. It is envisioned that forwards will still choose to place the applique **50** over both sides of their blade, as most forwards use both sides of the blade to control the puck **30**. However, goalies typically only use one face of their blade, and as such, may choose not to place the applique **50** on the back side of the blade.

The second surface **60** of the applique includes an adhesive for adhesively attaching the base member **54** to the surface of the blade **18**. The adhesive used can be similar or identical to the adhesive used currently with multi-purpose hockey tapes.

The first surfaces of most of the embodiments of the present invention include a plurality of substantially non-deforming protrusions that are formed on the first surface **56** of the applique. (The ridges **102, 104, 106** of the embodiment shown in FIGS. **13–15** may not quite constitute "protrusions.") Except for the embodiment shown in FIG. **10**, the protrusions **62** are all formed to extend above the first surface **56** of the base member **54**.

As will be discussed in more detail below, the protrusions **62** can assume a variety of forms and shapes, many of which are discussed in connection with various embodiments shown in the drawings. However, several common features unite all of the embodiments. First, the protrusions **62** are disposed on the first surface of the base member **54** of the applique **51** in an ordered array. The array is ordered to maximize the frictional engagement between the protrusions **62** and, hence, the first surface **56** of the applique **50** with the side surface **34** of the puck **30**. In the embodiments shown in FIGS. **7** and **8–9**, the protrusions are arrayed to maximize the probability of the insertion of the protrusions **62** of the appliques **51, 69** into the recesses **38** of the puck **30**. In the embodiments shown in FIG. **10**, a series of depressions are used which are placed in an ordered array to maximize the probability of the protrusions **36** of the side surface **34** of the puck **30** being received into the cross-hatched recesses **66** formed on the applique **50**. One feature of the protrusions and recesses is that the enhanced frictional engagement that they provide help the user to lift and spin the puck when the user shoots the puck.

A second common feature which unites the protrusions, is that they are substantially non-deformable. Preferably, the protrusions and base member of the embodiments shown in FIG. **7–9** are formed to have a durometer hardness of somewhere between about **75** and **95**, Shore A. As will be appreciated, protrusions of this hardness are not completely non-deformable, such as would be the case with protrusions which comprise a sand grit. Conversely, protrusions **62** are not substantially deformable when engaging a puck surface, as one might expect from the "hooks" or "eyes" typically associated with a VELCRO cloth material. Rather, the protrusions **62** should be substantially stiff enough to engage the recesses **38**, and in some cases, to become nested in the recesses **38**, but still be soft enough to give the user some "feel", and to reduce the velocity of deflection of the puck on the applique (e.g., 51) when the puck **30** strikes the applique bearing blade.

As is best shown in FIG. **7**, the protrusions **62** are preferably received in the recesses **38** of the side surface **34** of the puck **30**. Because of the particular pattern (discussed in connection with FIGS. **8** and **9**), not every protrusion **62** is likely to find a corresponding recess **38**, nor are all recesses **38** likely to have a mating protrusion **62**.

The appliques **51, 69** shown in FIGS. **7–9** are intended primarily for use by forwards on their hockey sticks **10**. Because of the function performed by a forward, the appliques shown in FIGS. **7–9** are intended primarily to produce a somewhat "neutral" direction influencing characteristic of the blade when the blade is being used to "catch" a puck, such as when a forward is using his blade to catch a passed puck. Additionally, the appliques of FIGS. **7–9** are intended to have a primarily "neutral" direction influencing means when the forward is using the stick to control the puck, such as when he is advancing the puck down the ice. The enhanced frictional engagement between the puck and the stick that is provided by the appliques **51, 69** of FIGS. **7–9** help to enable the user to better control the puck as the forward is advancing it down the ice, by making the applique, and hence the stick, "grippier."

An applique **69** having a most preferred protrusion pattern **70** is shown in FIGS. **8** and **9**. The protrusion pattern **70** has been found by the applicants to be configured to maximize the likelihood that the protrusions (e.g., protrusion **72**) will become engaged within the recesses **38** of the pucks of all of the three patterns (Czechoslovakian, Canadian/Slovakian, and Chinese) discussed above.

The drawing shown in FIG. **8** shows the pattern **70** as being enlarged 5 times from its actual size. In actuality, the pattern **70** shown in FIG. **8** will have a length and width each of ⅞ths inch. The preferred dimensions for the pattern shown in FIG. **8** are given below, with reference to the letters shown in FIG. **8**.

Letter Designation	Dimension
A	0.433 inch
B	0.107 inch
C	0.144 inch
D	0.070 inch
E	0.254 inch

-continued

Letter Designation	Dimension
F	0.125 inch
G	0.250 inch
I	0.030 inch
J	0.032 inch
K	0.250 inch
M	0.021 inch
N	60°
P	0.01 inch
Q	0.02 inch

The protrusions generally are arrayed in a repeating pattern of first rows of protrusions and second rows of protrusions. Although the assignment of protrusion groups to "rows" is somewhat arbitrary, for purposes of this discussion, it will be assumed that the rows extend at approximately 60° angles (angle N) from a longitudinal axis X of the pattern. Although the preferred angle N at which the rows are canted is 60°, the rows can be angled anywhere generally between about 45° and 70° from axis X. The rows **75, 76** are preferably disposed at about 0.1 inches apart (B—B) to leave some free space therebetween.

The first and second rows **75, 76** each comprise an ordered array of protrusions in a repeating pattern, wherein the first row and the second row are repeated throughout the particular "pattern", and, in fact, throughout the entire length of the patch or tape roll which comprises the applique **50**. First row **75** includes a series of two protrusion groups, including a first protrusion group **78** and a second protrusion group **80**. The first protrusion group **78** comprises a single protrusion, and the second protrusion group **80** comprises a pair of closely spaced protrusions. As one moves up row **75**, it will be noticed that row **75** comprises a repeating pattern of first and second protrusion groups **78, 80** throughout the pattern.

Second protrusion row **76** also comprises an alternating array of first and second protrusion groups **82, 84**. The first protrusion group **82** comprises a pair of closely spaced protrusions, and the second protrusion group **84** comprises a "diamond-shaped" array of four protrusions.

A single protrusion **86** is shown in cross section in FIG. **9** as being generally hemispherical or "pimple" shaped in configuration and having a height P—P to cause the protrusion to extend approximately 0.1 inches above the first surface **56** of the applique **50**. The diameter of the protrusion Q—Q is approximately 0.02 inches. The size and hemispherical shape of the protrusions is believed by applicant to maximize the ability of the protrusion **86** to become inserted into a recess **38** formed in the side surface **34** of the hockey puck **30**, regardless of whether the hockey puck uses a "Canadian/Slovakian", "Czechoslovakian", or "Chinese" side surface pattern. In tests conducted by the applicant, using the pattern discussed above, the applicant found that the particular pattern greatly improved the frictional engagement between the applique **50** and the side surface **34** of the hockey puck, and resulted in an approximately 69% increase in the average friction coefficient, when compared to a multi-purpose such as is typically used currently on hockey stick blades **18**.

Although the protrusions discussed in connection with applique **69** have their most obvious utility when used in connection with an ice hockey puck, the applicants have found that the applique **69** works very well with smooth surfaced game pieces such as street hockey pucks and street hockey balls. When used with smooth surfaced game pieces, applique **69** is believed to increase the player's control of the game piece by increasing the frictional co-efficient between the game piece and the applique **69**, thereby giving the user an enhanced ability to lift and spin the game piece. This enhanced ability to lift, spin and control the game piece also occurs with ice hockey pucks.

As stated above, the protrusions, such as protrusion **82**, should be substantially non-deformable, and have a durometer hardness of preferably between about 75 and 95, Shore A. To create these protrusions, having this hardness, the base material **54** should be preferably made from a PVC type material, having a thickness of between about 0.08 and 0.14 inches. An adhesive is applied to the second side surface in a conventional manner. A release liner will be attached to the second surface, which is removed before the second surface of the applique is applied to the blade of the stick. The protrusions are formed on the first side surface by embossing the protrusions onto the base member.

An alternate embodiment pattern for an applique **88** is shown in FIG. **10**. The applique **88** shown in FIG. **10** includes a cross-hatched pattern of recesses **66** which extend downwardly, generally below the level of the first surface **90**. The recesses **66** are formed in a cross-hatched pattern and are sized and positioned for maximizing their reception of the cross-hatched series of ridges **36** formed on the side surface **34** of the hockey puck **30**. As will be appreciated, the recesses **66** should be slightly wider, and slightly deeper, than the corresponding ridges of the side surface **34** of the hockey puck **30**, to maximize the ability of the cross-hatched recesses **66** to receive the cross-hatched protrusions **36** of the hockey puck **30**.

FIGS. **11** and **12** show various wrapping patterns that can be used with appliques of the present invention that are provided in tape roll form. It is believed by the applicant that the more traditional vertical wrap pattern **92** will likely be used by most players, and especially by ice hockey players. However, the alternate, "horizontal wrap" **94** will likely be preferred by street hockey players so that the row of holes **95** across the upper portion of the blade will continue to remain exposed, and not be covered up by the applique.

Another alternate embodiment for an applique **98** is shown in FIG. **13**. Applique **98** includes base member **99** having a first surface **101**, and a second surface **103**. Second surface **103** has an adhesive applied thereto, for enabling the second surface **103** to be adhesively attached to the surface of a hockey stick. The first surface **101** includes a series of direction influencing means for influencing the direction of deflection of the game piece (puck **30**) off the first surface **101** toward a predetermined direction. The direction influencing means comprise a series of ridges, including first ridge **102**, second ridge **104**, and third ridge **106**. The first, second and third ridges, **102, 104, 106**, are preferably disposed in a parallel relation both to each other, and to the major axis X of the applique **98**. The ridges, **102, 104, 106**, define a series of parallel, incrementally raised steps, including first step **108**, second step **110** and third step **112**. The second step **110** has a relatively raised level, compared to the first step **108**, and the third step **112** has a relatively raised level when compared to the second step **110**. Preferably, the second step **110** is between about 0.01 and 0.04 inches thicker than the first step **108**, and the third step **112** is between about 0.01 and 0.04 inches thicker than the second step **110**. Additionally, each of the steps **108, 110, 112** has a width W (FIG. **13**) of between about 0.2 and 0.5 inches.

Most preferably, the first step **108** has a thickness (including its base member) of about 0.008 inches; the

second step **110** has a thickness of about 0.028 inches; and the third step **112** has a thickness of about 0.048 inches. Additionally, each of the steps **108, 110, 112** has a width W of approximately 0.333 inches. Thus, for an applique, such as applique **98** having a 3-step, **108, 110, 112** configuration, the entire width of applique **98** would be approximately 1 inch. Additionally, the angle formed by the plane of the second surface **103**, and the average rise of the steps **108, 110, 112** of the first surface **101** would be approximately 4°.

The ridges **102, 104, 106** and steps **108, 110, 112** help to deflect a puck in direction which is generally downwardly toward the ice. It has been found by the applicant that the size and position of the ridges **102, 104, 106** help to contribute to this downward deflection through the engagement of the ridges **102, 104, 106** with the ridges **35, 36** and **37** of the puck. Further, the **40** overall angle of the applique helps ensure that the puck **30** does not strike the applique flushly.

Preferably, applique **98** is formed by an extrusion process, with the base member being made from a PVC type material having a durometer hardness of preferably between about **65** and **85**, Shore A.

The pattern shown in FIGS. **13** and **14** differs somewhat in purpose from the pattern **70** shown in FIGS. **8** and **9**.

The primary purpose of the protrusion pattern **70** (FIG. **8**) is to increase the frictional engagement between the applique **50** and the side surface **34** of the hockey puck. However, the engagement between the applique **69** and the side surface **34** of the hockey puck **30** is intended to be somewhat neutral and is not necessarily designed to influence the direction in which a puck will deflect off the surface of the applique **69**. As such, a puck striking an applique **69** made with the pattern **70** (FIG. **8**) is no more likely to be influenced to deflect upwardly than it is to deflect downwardly, and is no more likely to influenced to bounce to the left, then it is to the right.

Notwithstanding this apparent neutrality of pattern **70** in the direction of deflection when a puck strikes the pattern, the applicants have found that a puck shot with a stick **10** containing pattern **70** will tend to be influenced to lift and spin. It is believed that this tendency to lift and spin is caused by a combination of the enhanced frictional engagement of the puck and pattern **70**, and the arcuate line of swing usually employed by a player shooting a puck.

However, the pattern **98** shown in FIGS. **13–15** is designed to influence the direction in which a puck will deflect, and the velocity of its deflection due to the softness of the applique. The particular pattern **98** shown in FIG. **13** is intended, when positioned on a hockey stick blade **20**, such as shown in FIG. **15**, to influence a puck striking the surface of the applique bands **98A, 98B, 98C** in a downward direction toward the surface of the ice.

The job of a goalie is to deflect oncoming pucks which are shot at the goal. From the goalie's perspective, it is most advantageous if the shot can be stopped "soft" wherein the goalie retains the puck against his stick, so that he can either trap it to prevent a goal, or otherwise pass or direct it to one of this teammates. Goalies strive to avoid the situation wherein the puck bounces upwardly and becomes airborne. For these reasons, the goalies are motivated to deflect the puck downwardly onto the ice (or street) to better maintain control thereby.

The applique **98** shown in FIGS. **13–15** is designed to increase the likelihood that a puck striking the applique **98** will be deflected downwardly, when compared to known hockey tapes. The combination of the progressively thicker top portion (e.g., step **112**), and ridges **102, 104, 106**, help to capture the side and "corners" of the puck to drive it downwardly toward the ice. As such, the ridges **102, 104, 106** and steps, **108, 110, 112** comprise direction influencing vehicles for influencing the direction of a puck which strikes them to deflect off of the ridges **102, 104, 106** and steps, **108, 110, 112** in a predetermined direction. Although all pucks which hit the ridges **102, 104, 106** and steps **108, 110, 112** will not be deflected downwardly, the steps and ridges help to influence the puck to deflect downwardly, and increase the likelihood that a puck will deflect downwardly.

Turning now to FIG. **15**, the applique G8 is shown as being applied to a blade **20** of a goalie's stick. Three bands **98A, 98B** and **98C**, of the applique **98** are applied generally horizontally across the front face **114** of the blade **20**, and extend all the way between the heel and toe of the hockey stick blade. Although not shown, the applique **98** can be applied to the back side face and handle portion of the stick.

An alternate wrapping pattern **116** is shown in FIG. **16**, as including a first strip **120**, second strip **124** and third strip **126** which are disposed generally horizontally along the blade **20** of the hockey stick. However, the heel end **125** of the hockey stick includes a fourth strip **128** and a fifth strip **130** that are positioned at a diagonal to horizontal. Similarly, the toe end **131** includes a sixth strip **132** and a seventh strip **134** that are positioned at a diagonal to the horizontal. This particular wrap arrangement is believed to be beneficial to the goalie by influencing pucks which deflect off the stick **20** to bounce downwardly toward the ice, and also toward the middle of the stick. As will be appreciated, the horizontally disposed first, second and third strips, **120, 124, 126** will cause the puck to deflect downwardly toward the ice. The diagonal strips **128, 130, 132, 134** will cause the puck to bounce both downwardly toward the ice, and inwardly toward the center of the stick.

As is true in any sport, it is likely that users of the appliques will find an endless variety of patterns in which to apply the appliques to their sticks to achieve both perceived and real functional and aesthetic advantages.

FIGS. **17–31** show a variety of alternate embodiment appliques which include protrusion arrays and patterns that are designed to influence the direction in which a puck deflects off the surface of the applique, to influence the puck to move in a predetermined direction. Many of the appliques shown in FIGS. **17–23** are intended for use primarily with forward's hockey sticks **10**. As such, the "deflection" that will be influenced will primarily be the deflection of the puck off the applique when the user shoots or passes the puck with the stick **10**. This is in contrast to the primary "deflection" of the direction influencing means of pattern **98** which is used on a goalie's stick. As is discussed above, the primary deflection that is influenced by pattern **98** is the deflection off the applique **98** when a puck is shot at the goalie, and he is using his stick **12**, and the applique **98** thereon to stop the puck or to direct it to one side of the net or to his teammates.

The appliques shown in FIGS. **17–23** are intended primarily for use by forwards on their hockey sticks **10**. Because of the function performed by a forward, the appliques shown in FIGS. **17–23** have incorporated direction influencing protrusions which are intended primarily to effect the deflection of the puck when shot by the user, such as by inducing the puck to spin or to lift off the ice and become airborne. Additionally, as much of the function performed by a forward is to advance the puck down the ice while controlling it on the blade **18** of the stick **10**, the

appliques shown in FIGS. 17–23 are also intended to help increase the frictional engagement between the surface 34 of the puck 30 and the applique (and hence hockey stick) to enable the user to better control the puck as he is advancing it down the ice.

The appliques shown in FIGS. 24–31 are intended primarily for use by goalies. As such, these appliques have direction influencing protrusions whose primary purpose is to drive the puck downwardly toward the ice to help the goalie maintain control of the puck, and to prevent the puck 30 from becoming airborne if it deflects from the goalie's stick 12. Additionally, the protrusion patterns shown on the appliques of FIGS. 24–31 are also intended to help increase the frictional engagement between the applique and the side surface 34 of the hockey puck, to help the goalie better control the puck 30 on his stick 12.

The applique 150 shown in FIG. 17 contains a plurality of generally parallelly disposed longitudinal ridge members 152. The ridge members 152 are not continuous, but generally comprise ridge member segments.

The applique 156 shown in FIG. 18 is intended to give both spin and lift to a puck which is deflected from its surface. The applique 156 includes a series of protrusions 158, which each include a longitudinal trunk portion 160, and series of lateral, generally linear branch portions 152, which are connected to, and extend from the trunk portions 160.

The applique 166 shown in FIG. 19 includes an array of generally linear, laterally extending ridge type protrusions 168. It is believed that the protrusions 168 of applique 166 will help to influence a puck being shot from the stick to move in a pre-determined, spinning direction.

Applique 172 of FIG. 20 includes a series of protrusions 174 having a longitudinal trunk portion 176, and a series of generally "s"-shaped laterally extending branch portions 158 which are connected with the trunk portions 176, and extend generally laterally therefrom.

Applique 182 of FIG. 21 includes a series of generally laterally extending, crescent-shaped protrusions 184.

FIG. 22 shows an applique 188 having a series of generally longitudinally extending "s"-shaped protrusions 190 which are believed by applicant to influence a puck being deflected off the stick to spin.

The applique 194 of FIG. 23 is been intended primarily to help increase the frictional engagement between the applique 194 and the side surface 34 of the hockey puck 30, to better enhance the user's control of the puck. Applique 194 includes an array of cross-hatched ridge type protrusions 196. As stated above, the applique shown in FIGS. 24–31 are intended primarily for use by goalies, and as such are intended to influence the puck to be directed downwardly when deflected off of the applique, and also to enhance the goalie's control of the puck.

FIG. 24 shows an applique 200 that is intended primarily to drive the puck downwardly toward the ice, by including a series of chevron-shaped protrusions 202.

FIG. 25 discloses an applique 206 having a plurality of chevron-shaped protrusions 208 and a series of hemispherical, or flattened hemispherical "pimple" shaped protrusions 210, which are nested within the chevron protrusions 208.

Applique 214 of FIG. 26 includes a series of "y"-shaped protrusions 216, each of which include a companion hemispherical, or flattened hemispherical "pimple" shaped protrusion 218 that nests within the branches of the y-shaped protrusions 216.

The applique 222 of FIG. 27 contains a series of chevron shaped protrusions 224, wherein each of the chevron shaped protrusions 224 includes a series of branches 226 extending therefrom. As shown, the branches may extend generally perpendicular to the extent of the chevron leg to which they are attached, or alternately, may be disposed at some other angle.

The applique 230 of FIG. 28 contains a series of hemispherical, or flattened hemispherical, "pimple" shaped protrusions 232.

The applique 234 of FIG. 29 includes an array of closely spaced, truncated chevron shaped protrusions 236.

Applique 240, which is shown in FIG. 30, includes a series of chevron shaped protrusions 242. Each of the chevron shaped protrusions 242 includes a series of "s"-shaped branches which extend in a generally longitudinal direction.

The applique 248 shown in FIG. 31 includes a series of longitudinal trunk-shaped protrusions 250. A plurality of chevron-shaped branches 252 are attached to each of the longitudinal trunks 250.

An applique 270 for improving the user's grip on the handle 14 of a hockey stick is shown in FIGS. 32 and 33. The applique 270 includes a base member 272 having a second surface (not shown) to which an adhesive is applied, for adhesively attaching the base member 272 to the handle 14 of the hockey stick. The applique 270 also includes a first surface 274 having a longitudinally extending ridge member 276 formed thereon. If applique 270 is provided as a "roll" in a manner similar to conventional hockey tape, the ridge member 276 would preferably extend throughout the entire length of the applique 270. The applique 270 has a width W—W of approximately one inch. The ridge 276 is preferably centrally disposed along the longitudinal axis of the applique 270, so that it is equally spaced from each of the two sides 277, 279 of the applique. The ridge, has a height of preferably about ⅛th inch, and a width R'—R' of approximately ⅛th inch.

As best shown in FIG. 33, the applique 270 is placed in a series of adjacent, or slightly overlapping bands on the handle 14 of the hockey stick, near the end of the handle 14. In FIG. 33, four bands, 270A, 270B, 270C and 270D of applique 270 are shown as being applied in an adjacent, non-overlapping relationship on the handle 14. When so placed, the handle includes four ridges 276A, 276B, 276C and 276D, with each corresponding to their respective band 270A–D of the applique 270 and with each extending at about a 45° angle to longitudinal axis of the handle. When so positioned, the distance D between adjacent ridges (e.g., 276A and 276B; and 276C and 276D) is approximately one inch. This width is chosen as it provides the user with enough room to generally place one gloved finger between each adjacent ridge pair. For example, in the illustration shown in FIG. 33, the user would preferably place his "pinky" finger between ridges 276A and 276B; his third finger between ridges 276B and 276C; his second finger between ridges 276C and 276D; and his index finger below ridge 276D.

The existence of the ridges helps to prevent the user's gloved hands from slipping up and down on the hockey stick. Additionally, the ridges help to cause the user to place his fingers in a consistent position on the hockey stick. This consistency in the positioning of the user's fingers should help to improve the user's ability to manipulate the stick and to shoot the puck 30.

An applique configuration 288 is shown in FIG. 34, which includes a first applique portion 290 and a second applique

portion **292**. The first applique portion **290** includes a series of first direction influencing means **294** for influencing the puck to deflect from the applique **290** in a first predetermined direction. A second applique portion **292** includes a series of second direction influencing means **296** which are designed for influencing the puck to deflect off the second applique portion **292** in a second predetermined direction, which may or may not be different than the first predetermined direction in which first applique portion **290** deflects the puck.

The first applique portion **290** can be an applique similar to applique **98**, which is shown in FIGS. **13–16**. As discussed above, the purpose of the direction influencing means **294** of an applique, such as appliques **98** or **290**, is to drive the puck downwardly toward the ice. The second direction influencing means **296** of the second applique portion **292** are similar to the respective protrusions **158** and applique **156** shown in FIG. **18**. As discussed in connection with FIG. **18**, the purpose of the second direction influencing means **296** is to induce a puck to move in a predetermined "spin" direction, and to cause the puck further to lift off the ice when shot.

The two zone applique configuration **288** shown in FIG. **34** might be used by a forward on the blade **18** of his hockey stick, to enable the forward to achieve two different desired goals with his applique **288**. The upper, first applique portion **290** would tend to drive the puck downwardly towards the ice. This would help to improve the forward's control of pucks that the forward is receiving from teammates, or intercepting from other players. The bottom, second applique portion **292** would help the forward to direct the puck in an intended, "lift and spin" direction when the forward is shooting the puck at the goal, or passing it to teammates. As such, through the use of the two zone protrusion, the user could obtain two different sets of advantages, which would help the user in two different circumstances encountered during the play of a hockey game.

Although the invention has been described in detail with reference to the illustrated preferred embodiments, variations and modifications exist within the scope and spirit of the invention as described and as defined in the following claims.

What is claimed is:

1. An applique for placement on a hockey stick blade for improving the engagement of the hockey stick blade with a hockey puck, said puck having a cylindrically vertically extending peripheral surface, said surface having an ordered array of recesses therein, said hockey puck being pushable along a playing surface by the hockey stick, the applique comprising

(1) a base member having a first surface and a second surface,

(2) means for adhesively attaching the second surface to the hockey stick blade, and

(3) an ordered array of substantially non-deforming protrusions extending above the first surface for engaging said recesses in said hockey puck, wherein the engagement of the protrusions with the recesses facilitates temporary maintenance of the engagement between the hockey stick blade and the recess containing surface of the hockey puck when the hockey stick is pushing said hockey puck along the playing surface.

2. The device of claim **1** wherein said array of protrusions is ordered to maximize the probability of the insertion of the protrusions of the applique into the recesses in the puck.

3. The device of claim **2** wherein the ordered array of protrusions comprises a repeating pattern of first rows of protrusions and second rows of protrusions, the first rows of protrusions being different from the second rows of protrusions.

4. The device of claim **3** wherein the first rows of protrusions comprise a repeating pattern of first and second protrusion sets, and the second rows of protrusions comprise a repeating pattern of first and second protrusion sets.

5. The device of claim **4** wherein

(a) the first protrusion set of the first rows comprises a set containing a single protrusion,

(b) the second protrusion set of the first rows comprises a set containing a pair of protrusions,

(c) the first protrusion set of the second rows comprises a set containing a pair of protrusions, and

(e) the second protrusion group set comprises a set containing four protrusions.

6. The device of claim **5** wherein the applique includes a longitudinal axis, and the rows extend at an angle from the longitudinal axis of the applique of between about 45 degrees and 75 degrees, and the distance between adjacent rows is about 0.1 inches.

7. The device of claim **1** wherein the protrusions extend about 0.01 inches above the second surface, and have a durometer hardness of between about 75 and 95, Shore A.

8. The device of claim **1** wherein the ordered array of protrusions comprises repeating, alternating rows of protrusions including a first row of protrusions and a second row of protrusions, the first and second rows each including a series of protrusion sets.

9. The device of claim **8** wherein the protrusion sets of at least one of the first and second rows comprises an alternating series of first protrusion sets and second protrusion sets, said protrusion sets being positioned to maximize the probability of insertion of the protrusions into recesses of the game piece.

10. The device of claim **1** wherein the applique comprises a flexible tape.

11. The device of claim **10** wherein the game piece surface includes an ordered array of protruding portions, and the applique includes an ordered array of recesses that are sized and positioned to maximize the engagement of the recesses with the protruding portions of the hockey puck.

12. An applique for placement on a hockey stick for improving the engagement of the hockey stick blade with a game piece, said game piece having a cylindrical vertically extending peripheral surface, said surface having an orderly array of recesses therein, said applique comprising

(1) a base member having a first surface and a second surface,

(2) means for adhesively attaching the second surface to the hockey stick blade, and

(3) an ordered array of substantially non-deforming protrusions extending above the first surface for engaging the game piece surface,

wherein the protrusions are generally hemispherical in shape, and are sized for engaging the recesses in said game piece surface.

13. An applique for placement on a hockey stick blade for improving the engagement of the hockey stick blade with a hockey puck said hockey puck having a cylindrical vertically extending peripheral surface, said surface having an ordered array of recesses therein the hockey puck being pushable along a playing surface by the hockey stick, a hockey stick having a blade the applique comprising

(1) a base member having a first surface and a second surface,

(2) means for adhesively attaching the second surface to the hockey stick blade, and

(3) an ordered array of substantially non-deforming protrusions extending above the first surface for engaging the recesses in said surface,

wherein the ordered array of protrusions comprises a repeating pattern that includes a first row of protrusions and a second row of protrusions, the first row of protrusions being different from the second row of protrusions.

14. An applique for placement on a hockey stick blade for improving the engagement of the hockey stick blade with a hockey puck, said puck having a cylindrical vertically extending surface, said surface having an ordered array of protrusions therein said hockey puck being pushable along a playing surface by a hockey stick having a blade, said applique comprising

(1) a base member made from a non-water absorbent material having a first surface and a second surface,

(2) means for adhesively attaching the second surface to the hockey stick blade, and

(3) an ordered array of non-deforming protrusions extending above the first surface for engaging said recesses in said puck surface, said ordered array of protrusions comprising a repeating pattern of first rows of protrusions and second rows of protrusions, the first rows of protrusions comprising a repeating pattern of first and second protrusion sets, and the second rows of protrusions comprising a repeating pattern of first and second protrusion sets, the protrusion sets of the first rows of protrusions being different than the protrusion sets of the second rows of protrusions,

wherein the engagement of the protrusions with the recesses facilitates temporary maintenance of the engagement between the hockey stick blade and the hockey puck when the hockey stick is pushing the hockey puck along a playing surface.

15. An applique for placement on a hockey stick blade for improving the engagement of the hockey stick blade with a hockey puck said puck having a cylindrical vertically extending surface, said surface having an ordered array of recesses therein, said hockey puck being pushable along a playing surface by the hockey stick, said applique comprising

(1) a base member having a first surface and a second surface,

(2) means for adhesively attaching the second surface to the hockey stick blade, and

(3) an ordered array of substantially non-deforming protrusions having a durometer hardness of between about 75 and 95, Shore A, the protrusions extending about 0.01 inches above the first surface for engagement with the recesses in said hockey puck,

wherein the engagement of the protrusions with the recesses facilitates temporary maintenance of the engagement between the hockey stick and the recess containing surface of the hockey puck when the hockey stick is pushing hockey puck along the playing surface.

* * * * *

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US006668504B2

(12) **United States Patent**
Hughart

(10) **Patent No.: US 6,668,504 B2**
(45) **Date of Patent: Dec. 30, 2003**

(54) **SOUND-DEADENED WALL AND WALL PANEL FOR SAME**

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(73) Assignee: **Knight-Celotex, L.L.C.**, Northfield, IL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 27 days.

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(22) Filed: **Apr. 11, 2002**

(65) **Prior Publication Data**

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(52) **U.S. Cl.** **52/481.1**; 52/481.2; 52/144; 181/284; 181/294
(58) **Field of Search** 52/144, 481.2, 52/481.1; 181/284, 290, 293, 294

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(57) **ABSTRACT**

In a sound-deadened wall comprising wooden studs, each of which has a front edge and a back edge, a front wall panel is fastened to the front edges of the studs and a back wall panel is fastened to the back edges of the studs. Further, front spacers are positioned along the front edge of each stud, between the front edge of said stud and the front wall panel, so as to define air gaps between the front edge of said stud and the front wall panel, and back spacers are positioned along the back edge of each stud, between the back edge of said stud and the back wall panel, so as to define air gaps between the back edge of said stud and the back wall panel. Each wall panel has two expansive surfaces and the associated spacers are defined by elastomeric strips adhering to such wall panel, on the expansive face to face the associated edges of the studs, before such wall panel is fastened to the associated edges of the studs. Screws are driven through the wall panels, through the elastomeric strips, into the studs to fasten the wall panels to the studs.

6 Claims, 1 Drawing Sheet

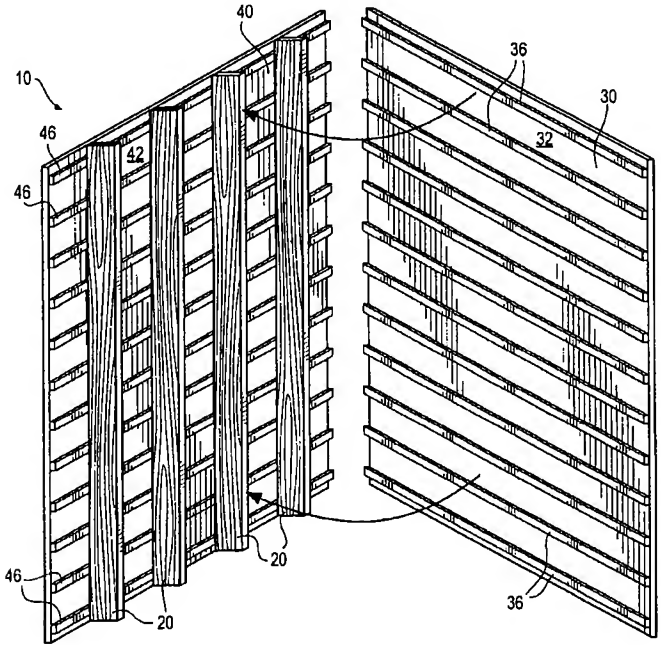
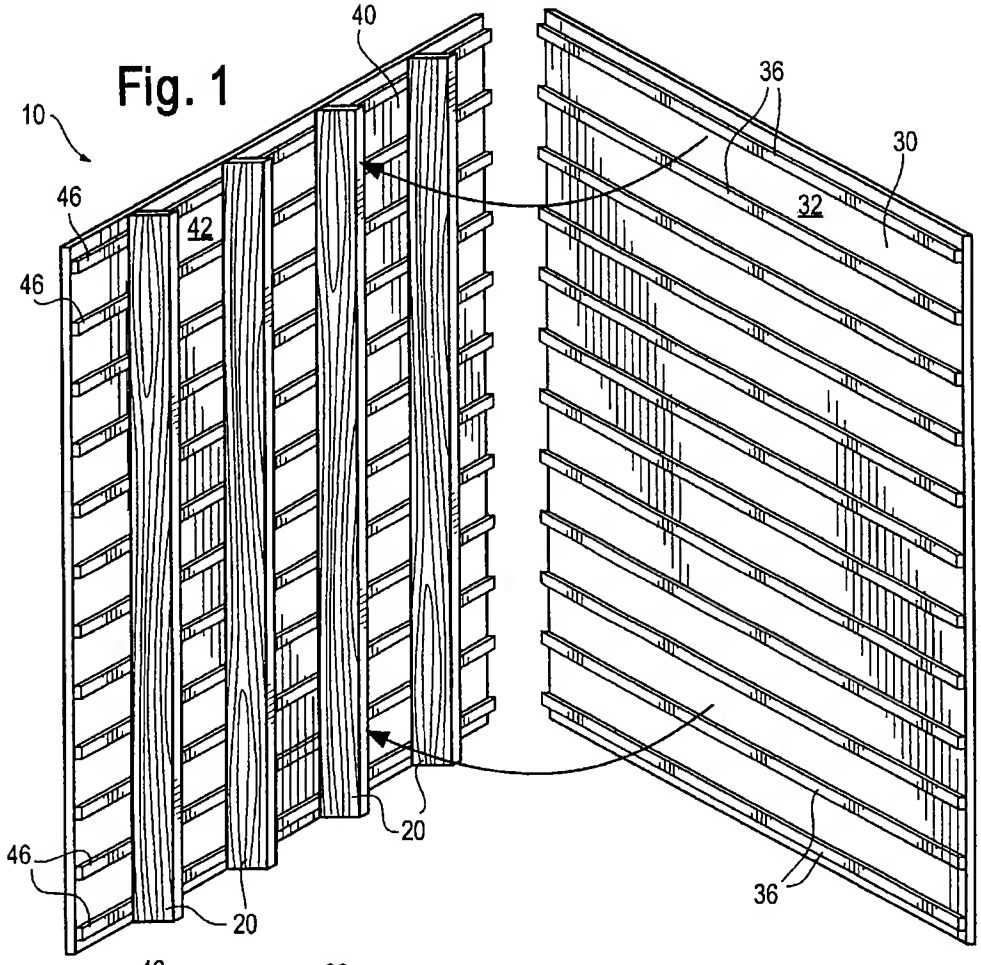


Fig. 1



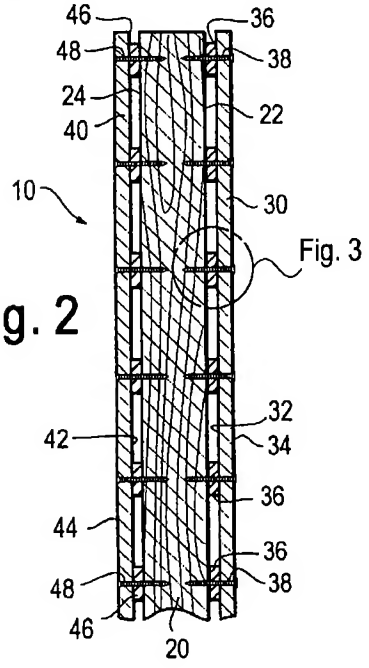
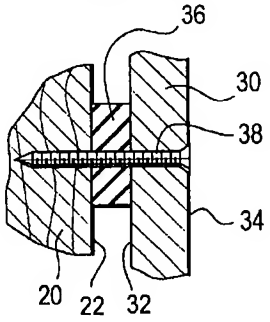


Fig. 2

Fig. 3



SOUND-DEADENED WALL AND WALL PANEL FOR SAME

FIELD OF THE INVENTION

This invention pertains to a sound-deadened wall and to a wall panel, such as a panel of gypsum drywall board or of fiberboard, for a sound-deadened wall. This invention contemplates that, in a sound-deadened wall embodying this invention, spacers define air gaps between studs and the wall panel.

BACKGROUND OF THE INVENTION

Commonly, in residential and commercial construction, interior walls are constructed with vertical wooden or steel studs, to which gypsum drywall or fiberboard panels are fastened, as by screws driven through the panels into the studs. Sounds tend to be easily transmitted through such walls, as from one room to another, unless such walls are insulated sufficiently with sound-deadening insulation, such as fiberglass mats.

SUMMARY OF THE INVENTION

This invention provides a sound-deadened wall, which does not require sound-deadening insulation. Broadly, the sound-deadened wall comprises studs, a wall panel fastened to the studs, and spacers positioned along each stud, between said stud and the wall panel, so as to define air gaps between said stud and the wall panel. This invention is useful whether the studs are wooden or steel and whether the wall panel is a panel of gypsum drywall or of fiberboard.

Preferably, in a sound-deadened wall embodying this invention, the spacers are elastomeric. Moreover, the spacers may be advantageously defined by elastomeric strips adhering to the wall panel, on the expansive surface to face the studs, before the wall panel is fastened to the studs. Preferably, the wall panel is fastened to the studs by fasteners driven through the wall panel, through the spacers, into the studs. The fasteners may be screws or, if the studs are wooden, the fasteners may be staples, ring-shanked nails, or other nails.

In a preferred embodiment, in which each stud has a front edge and a back edge, a front wall panel is fastened to the front edges of the studs with front spacers positioned along each stud, between said stud and the front wall panel, so as to define air gaps between said stud and the wall panel. Moreover, a back wall panel is fastened to the back edges of the studs with back spacers positioned along each stud, between said stud and the back wall panel, so as to define air gaps between said stud and the wall panel.

This invention also provides a wall panel, which is useful in a sound-deadening wall, as described above. The wall panel, which has two expansive surfaces and which is fastenable to studs, has spacers adhering to a selected one of the expansive surfaces. The spacers are adapted to define air gaps between the studs and the wall panel when the wall panel is fastened to the studs.

Preferably, in a wall panel embodying this invention, the spacers are elastomeric. Moreover, the spacers may be advantageously defined by elastomeric strips adhering to the wall panel, on the expansive surface to face the studs, before the wall panel is fastened to the studs.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a fragmentary, partially exploded view of a wall panel having elastomeric strips defining spacers, as discussed above, and being fastened to studs so as to provide a sound-deadened wall embodying this invention.

FIG. **2** is a cross-section of the sound-deadened wall, which has a front wall panel and a back wall panel, as discussed above.

FIG. **3** is an enlarged detail, as taken in a region delineated by a broken-line circle in FIG. **2**.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

As illustrated, a sound-deadened wall **10** embodying this invention is constructed from an array of wooden studs **20** extending vertically, a front wall panel **30** fastened to the studs **20**, and a back wall panel **40** fastened to the studs **20**. Each stud **20** has a front edge **22** and a back edge **24**. The respective wall panels **30**, **40**, are similar and are fastened to the studs **20** similarly.

The front wall panel **30**, which has two expansive surfaces **32**, **34**, has an array of elastomeric strips **36** extending horizontally and adhering to the expansive surface **32** that faces the front edges **22** when the front wall panel **30** is fastened to the studs **20**. The front wall panel **30** is fastened to the studs **20**, at the front edges **22**, via screws **38** driven through the front wall panel **30**, through the elastomeric strips **36**, into the studs **20**. The elastomeric strips **36** define air gaps between the studs **20** and the front wall panel **30**.

The back wall panel **40**, which has two expansive surfaces **42**, **44**, has an array of elastomeric strips **46** extending horizontally and adhering to the expansive surface **42** that faces the back edges **24** when the back wall panel **40** is fastened to the studs **20** at the back edges **24**. The back wall panel **40** is fastened to the studs **20**, at the back edges **24**, via screws **48** driven through the back wall panel **40**, through the elastomeric strips **46**, into the studs **20**. The elastomeric strips **46** define air gaps between the studs **20** and the back wall panel **40**.

Each wall panel **30**, **40**, may be a panel of gypsum drywall or of fiberboard, which is preferred. The elastomeric strips **36**, **46**, are similar and may be made of a synthetic rubber, such as neoprene, of a polymeric foam, such as polyurethane foam, or of an elastomeric polymer, such as polyvinyl chloride having a hardness of Durometer 92 Shore A. Any suitable adhesive is used to cause the elastomeric strips **36**, **46**, to adhere to the respective wall panels **30**, **40**. Alternatively, but less desirably, non-elastomeric spacers are used.

Air gaps defined by the elastomeric strips **36**, between the studs **20** and the front wall panel **30**, and air gaps defined by the elastomeric strips **46**, between the studs **20** and the back wall panel **40**, tend to muffle sounds that would be easily transmitted between the respective wall panels **30**, **40**, if the respective wall panels **30**, **40**, were to contact the studs **20** directly.

What is claimed is:

1. A sound-deadened wall comprising wall studs, a wall panel fastened to the studs, elastomeric spacers adhering to the wall panel between said studs and the wall panel and being oriented so as to cross the studs and to define air gaps between said studs and the wall panel, and wherein the wall panel is fastened to the studs by fasteners driven through the wall panel, through the spacers, into the studs.

2. The sound-deadened wall of claim **1** wherein the wall panel has two expansive surfaces and wherein the elastomeric spacers are defined by strips adhering to the wall panel, on the expansive face to face the studs, before the wall panel is fastened to the studs.

3. A sound-deadened wall comprising wall studs, each stud having a front edge and a back edge, a front wall panel fastened to the front edges of the studs and a back wall panel fastened to the back edges of the studs, front elastomeric spacers adhering to the front wall panel between the front edge of said studs and the front wall panel, and being oriented so as to cross the studs and to define air gaps between the front edge of said stud studs and the front wall panel, wherein the front wall panel is fastened to the studs by fasteners driven through the front wall panel, through the front spacers, into the studs, and back elastomeric spacers adhering to the back wall panel between the back edge of said studs and the back wall panel, oriented so as to cross the studs and to define air gaps between the back edge of said stud and the back wall panel, wherein the back wall panel is fastened to the studs by fasteners driven through the back wall panel, through the back spacers, into the studs.

4. The sound-deadened wall of claim 3 wherein the front wall panel has two expansive surfaces and wherein the front elastomeric spacers are defined by snips adhering to the front wall panel, on the expansive face to face the front edges of the studs, before the wall panel is fastened to the front edges of the studs and wherein the back wall panel has two expansive surfaces and wherein the back elastomeric spacers are defined by strips adhering to the back wall panel, on the expansive face to face the back edges of the studs, before the back wall panel is fastened to the back edges of the studs.

5. A wall panel, which has two expansive surfaces, which is fastenable to studs, and which has elastomeric spacers adhering to a selected one of the expansive surfaces, the elastomeric spacers and being oriented so as to cross the studs and define air gaps between the studs and the wall panel when the wall panel is fastened to the studs, wherein the wall panel is fastened to the studs by fasteners driven through the wall panel, through the elastomeric spacers, into the studs.

6. The wall panel of claim 5 wherein the elastomeric spacers are defined by strips adhering to the selected one of the expansive surfaces.

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Patented July 10, 1951

2,559,990

UNITED STATES PATENT OFFICE

2,559,990

INSULATING TAPE

Ralph J. Oace, New Canada Township, Ramsey County, and Robert Burns Snell and Esther E. Eastwold, St. Paul, Minn., assignors to Minnesota Mining & Manufacturing Company, St. Paul, Minn., a corporation of Delaware

No Drawing. Application January 12, 1946, Serial No. 641,000

5 Claims. (Cl. 117—122)

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This invention relates to the insulation and protection of electrical conductors, and to insulating tape employed therein.

Synthetic polymeric materials have recently replaced rubber and guttapercha to a great extent in the insulation of wires and cables, particularly those exposed to outdoor conditions or to oils or solvents. Materials such as polyvinyl chloride and polymers of ethylene, for example, have been applied by extrusion methods to copper wires to provide insulated conductors having excellent electrical characteristics as well as good chemical and mechanical properties. Such insulated wire has been widely accepted as an improved product.

The advantages of such insulation are not fully realized, however, when splices between lengths of the wire must be covered with previously known classes of insulation. The commonly used unvulcanized rubber base electrician's tape, for example, is not resistant to oils or sunlight, and does not adhere well to the synthetic polymer insulation. The tape is also low in mechanical strength, and a bulky outer wrapping of friction tape is ordinarily required to provide compression and mechanical protection.

As an alternative to the use of rubber insulating tape, strips of polymer of the same formula as that on the insulated wire have sometimes been used. In such an application, heating and molding are necessary in order to weld the polymer together into an integral insulating layer. The process is inconvenient and time-consuming, and requires special apparatus.

Attempts have previously been made to provide similar strips, or films, of polymer with adhesive coatings so as to avoid the necessity of the subsequent heating and molding operations in covering and insulating wire splices. For example, polyvinyl chloride plasticized with not more than 20 parts of the usual plasticizer such as tricresyl phosphate or dioctyl phthalate has been sheeted out in roll form in thicknesses up to 4 mils or greater, and coated with a specific pressure-sensitive adhesive consisting of rubber, polyisobutylene, and a resinous material, in an attempt to produce a transparent flexible adhesive tape or sheet. With this amount of plasticizer, however, the sheet is found to be quite stiff and rigid. Very high stress is required to obtain any appreciable elongation; for example, a strip one inch in width and .004 inch in thickness of a mixture of 100 parts of an 89:11 vinyl chloride-vinyl acetate copolymer and 20 parts of dioctyl phthalate required a stress of 30 lbs. to

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produce even as little as 10% elongation. Increased elongation results in a whitening of the film, and the stretched film will then no longer retract to its original length at room temperature. Films, or coated adhesive tapes, having these properties cannot readily be applied by hand to wire splices or the like. While thinner films of similar composition might conceivably be used because of their reduced strength per unit of width, the low elasticity still precludes the acceptance of such tapes for applications such as the covering of wire splices. In addition, thicknesses of at least about four mils, and even up to twelve mils or somewhat higher, are generally preferred by electricians because of the reduced number of turns required for adequate insulation, as well as the absence of the flimsiness characteristic of thinner films.

Films have also been prepared with increased amounts of dioctyl phthalate or the like in an attempt to reduce the stress requirements and improve the elasticity. Thus, a composition consisting of 100 parts of a vinyl chloride polymer and 33 parts of dioctyl phthalate was calendered to a thickness of four mils and coated with a pressure-sensitive adhesive as hereinabove described. While the physical properties of the film were much improved, it was found that this particular adhesive as well as various other pressure-sensitive adhesives rapidly became soft and "pasty" when in contact with this or other vinyl polymer films containing more than about 20 parts of liquid type plasticizers. The resulting tape, when wound under tension around a splice or bundle of wires, soon loosened and became ineffective. This tendency was increased with even slight increase in temperature above normal room temperature.

The present invention avoids these and other defects of previously known insulating and binding materials of the type described, and provides, among other things, an improved insulated spliced electrical conductor which is electrically, mechanically and chemically effective, and which may be readily and quickly prepared without the use of special procedures or equipment.

These unique and valuable results are obtained by utilizing an insulating tape in the form of a relatively thick but easily stretchable and highly elastic pressure-sensitive adhesive tape comprising a well-bonded, water-insoluble, non-corrosive, normally tacky and pressure-sensitive adhesive coating on a plasticized vinyl chloride polymer film which is in permanent equilibrium with the adhesive. By "permanent equilibrium"

it is meant that the pressure-sensitive adhesive layer neither softens (becomes "pasty") nor loses tackiness (becomes non-adherent) on prolonged contact with the backing or film layer. The adhesive remains aggressively tacky, and also remains "eucohesive" (by which it is meant that it is more cohesive than adhesive such that offsetting or transfer of adhesive material does not result when the tape is unwound from rolls or removed from surfaces to which temporarily applied and can be handled without transfer of adhesive material to the fingers).

In order to secure permanent equilibrium between backing and adhesive, we employ with the vinyl chloride polymer a combination of modifiers including a substantial but minor amount (not to exceed about 20 parts per 100 parts of the vinyl polymer) of a low molecular weight liquid plasticizer such as dioctyl phthalate, together with a substantially equal or somewhat greater amount of a high molecular weight resinous type plasticizer, the amount of the latter in any event being sufficient, together with the liquid plasticizer, to provide the desired degree of stretch in the final film. "Paraplex G–25" is a preferred example of a suitable resinous type plasticizer. It is sold by Resinous Products & Chemicals Corp., and is a soft, viscous alkyd resin having a specific gravity of 1.06, and an acid number of not more than 2.0; it is soluble in esters, ketones, aromatic and chlorinated hydrocarbons. Another high-molecular-weight plasticizer material which has been found useful in providing suitably stretchable and elastic vinyl polymer films is polymerized ethyl acrylate. Another example is polymerized vinyl butyl ether.

While resinous or high molecular weight modifiers such as "Paraplex G–25" are themselves capable of producing the desired degree of strength, stretch and elasticity in vinyl chloride polymer films, and furthermore are generally classed as "non-migrating" or "permanent" type modifiers or plasticizers, it is surprisingly found that these materials do not provide for permanent equilibrium of adhesive and backing as herein defined. Instead, it has been shown that pressure-sensitive adhesives in prolonged contact with highly stretchable and elastic films consisting solely of vinyl polymer and resinous modifier lose a great deal, if not all, of their initial tackiness or pressure-sensitivity. When tape made in this way is unwound from roll form, after a moderate period of storage, and applied to a splice, it does not adhere either to the electrical conductor or to its own backing, and hence is of no value as an insulating and protective coating.

The present invention provides an electrical insulating tape having properties of stretch and elasticity which render it highly effective for wrapping wire and cable splices. The tape is stretchable to the extent of at least about 50% at room temperature as measured in a tensile tester (such as a Serigraph Model I–P–4, manufactured by the Henry L. Scott Co. of Providence, R. I.). The tape can be readily stretched to this extent by pulling between the hands. In fact, the invention provides tapes which are stretchable to the extent of at least about 100%, which is preferred. The elasticity of the tape is a valuable feature in making possible snug wrappings and coverings. The present tape is highly elastic as shown by the fact that when a strip is elongated 30% at room temperature and then released it will retract at room temperature to substantially the original length. The invention provides tapes that will substantially completely retract when elongated as much as 50% or even more. The method employed for making such retraction tests of elasticity is as follows. A number of tape lengths are cut. Each length is suspended from an upper clamp and is provided with a light clamp (weighing about 10 grams) at the lower end to provide means for applying a weight. Each tape strip is 1 inch wide and 5 inches long between clamps. Weights of various amounts are applied to the different samples to determine what weight is needed to produce the desired elongation (30%, for example) in 15 seconds. In the case of this sample, the weight is promptly removed at the end of the 15 seconds, and the length of the tape between clamps is measured at different time intervals to determine the retraction. The weight of the lower clamp is relatively so minute that it does not affect the result.

The preferred thickness of the backing film for the electrical tape is 4 to 20 mils. A thickness of about 5 to 10 mils is generally most useful.

The values of caliper, stretchability, flexibility, elasticity, adhesion, electrical properties, chemical stability or inertness, solubility, and other properties of the insulating tapes are designed and selected for greatest utility in the wrapping and protecting of splices in synthetic polymer insulated copper wire, as previously indicated. Some or all of these properties render the product useful for other purposes. For example, the adhesive tape may be used to bind together a number of insulated electrical conductors into a permanently compact, flexible, oil-resistant bundle or harness, by spirally winding such a bundle with a single overlapping strip of the tape applied under considerable tension. A similar spiral winding on metal racks employed in electroplating operations provides a chemically resistant coating which remains firmly attachel to the rack during immersion in the plating bath. Single thicknesses of the tape are useful as abrasion or wear-resistant adherent surface coatings on flat or curved surfaces.

The following examples of insulating tapes in the form of pressure-sensitive adhesive tapes having a vinyl polymer film base were prepared with a vinyl chloride-vinyl acetate copolymer softening at about 280° F, and in which the ratio of vinyl chloride to vinyl acetate was approximately 89:11. The commercially available "Vinylite VYNS," sold by Carbide and Carbon Chemical Corp., is a suitable copolymer corresponding to this description. Other equivalent materials include copolymers having other vinyl chloride-vinyl acetate monomer ratios, such as 95:5. Polyvinyl chloride itself is satisfactory in many formulations, as are many of the copolymers of vinyl chloride and vinylidene chloride, of which one example is "Geon 200–X–6," a vinyl chloride-vinylidene chloride copolymer having a softening temperature of about 260° F., sold by B. F. Goodrich Co. Polymers softening at 300° F. or higher are ordinarily to be preferred where extremely high heat resistance solvent resistance, and the like are essential.

Many liquid plasticizers other than the dioctyl phthalate of the various examples may be substituted therefor. The plasticizer must be compatible with the vinyl polymer, and must be sufficiently low in volatility so that it is not driven off during milling and calendering, or during subsequent storage and use. Tricresyl phosphate, dibutyl phthalates, and butyl phthalyl

butyl glycollate, for example, appear to be equally effective in most of the compositions herein described. All of these compounds are capable of producing pastiness in water-insoluble pressure-sensitive adhesives coated on vinyl backings when used in proportions greater than about 20 parts per 100 parts of the vinyl polymer.

Likewise, various compatible non-migrating resinous or high molecular weight modifying materials having a plasticizing effect on the vinyl polymer employed may be substituted in whole or in part for the specific alkyd resin hereinbefore mentioned. Ethyl acrylate polymer has been found useful, as previously noted; this modifier has somewhat less tendency to cause tack loss than does the "Paraplex G–25," hence may be used in even greater amounts in many formulations. A resinous material having properties essentially equivalent to Paraplex G–25 for our purposes has been prepared by heating together sebacic acid, propylene glycol, and ethylene glycol in a 10:9:1 molar ratio to a low acid number.

It will be understood that, where specific ratios of specific polymers, low molecular weight plasticizers, and high molecular weight plasticizers are described in the examples, substitution of equivalent but somewhat different materials may require alteration of these ratios in order to obtain equivalent results, all in conformity with well-recognized principles.

Various modifying agents which impart specific properties to the film may be added if desired. For example, a small amount of calcium stearate added prior to milling and calendering acts as a stabilizer in preventing darkening of the vinyl polymer or of the film. Other examples are lead silicate, calcium silicate, and triethanolamine.

In general, the tape products herein described are most conveniently and economically prepared by a series of steps including pre-mixing, milling, and calendering the vinyl polymer-plasticizer mixture into continuous film form, temporarily attaching the film to a carrier belt or web, coating the exposed surface of the film with an adhesive primer and subsequently with a pressure-sensitive adhesive, removing the coated film from the carrier, slitting into narrow widths, and winding the resulting adhesive tape into roll form on suitable cores. In place of calendering, other means may be employed for forming the film. Deposition from solution in a suitable volatile liquid vehicle, followed by heating to remove the vehicle and, where necessary, to homogenize the film, has some advantages, particularly in the case of the thinner films. However, the action of the calender or similar devices seems to impart some additional and desirable properties to the resulting film, particularly with respect to stretchiness and elasticity, and such methods are generally to be preferred.

Where a varnished cambric or Holland cloth carrier belt is used, sufficient adhesion of film to belt may be obtained simply by combining the two on the bottom roll of the calender under a light pressure and with the roll at a temperature of the order of 110° F. A heavy paper web with a light weight surface coating of a low tack pressure-sensitive adhesive may economically replace the varnished cambric. In any event, the carrier web is simply an aid to the successful commercial coating of the highly stretchable film, and may be dispensed with where other suitable methods of handling this type of material are available.

Primer and adhesive compositions are preferably, but not necessarily, applied from solution or suspension in a volatile liquid vehicle, as shown in the examples. The volatile vehicle is removed after each coating operation, preferably by evaporation at elevated temperatures.

Example 1

A mixture of 700 parts by weight of "Vinylite VYNS," 200 parts of "Paraplex G–25," 100 parts of dioctyl phthalate and 25 parts calcium stearate was milled together on a rubber mill, previously heated to 250° F., until homogeneous, and was then calendered to a thickness of 4 mils. The resulting transparent film was lightly bonded to a varnished cambric carrier web, and was then primed, after which it was coated with a pressure-sensitive adhesive. The primer was made by mixing 985 lbs. of an ammoniacal casein solution containing 80 lbs. of casein with 624 lbs. of an aqueous dispersion containing 38% by weight of a copolymer of 50 parts butadiene and 50 parts styrene. The primer coating was dried to remove the water, resulting in an extremely thin primer film. The formula of the pressure-sensitive adhesive was as follows:

	Parts by weight
Rubbery butadiene-styrene copolymer	100
Zinc oxide	5
Titanium dioxide	10
Yellow pigment	0.3
Oil-soluble heat-reactive phenol-aldehyde resin	12
Ester gum	40
Paraffin oil	25
Soft coumarone-indene resin	40
Heptane	300
Alcohol	about 10

In compounding the adhesive, the copolymer and pigments were first milled together. The mill base was then blended with the ester gum, paraffin oil, coumarone-indene resin, and finally with the phenol-aldehyde resin in a heated heavy duty internal mixer. After a brief further heating at a higher temperature, the batch was cooled. The heptane was then added in small portions, and sufficient alcohol was finally added to bring the viscosity to the proper value for coating. The primed film was coated with the adhesive solution, followed by drying to remove the solvent. About 6.5 to 7.5 grains of adhesive, on the dry basis, were applied to 24 square inches of the film.

The coated film was removed from the temporary liner and slit into narrow widths. The resulting tape was highly stretchable and elastic, and provided an excellent insulating and protecting covering when wound around an electrical conductor. On an irregular surface, such as a wire splice, the elasticity or regain was sufficient to provide an extremely compact covering. The tape was found to have at least about 100% stretch, and a tensile strength of about 20 lbs. per inch width.

Strips of the tape were stretched to 20% and to 50% elongation, and were then allowed to retract under no load. The strips returned to their initial length in 15 to 30 minutes and in 12 hours, respectively.

An adhesive tape was similarly prepared from a film in which the same polymer, resinous plasticizer, and liquid plasticizer were in the relative proportion of 100:29.5:17.6. This film was somewhat softer and more readily stretchable. How-

ever the adhesive coating was in permanent equilibrium with the backing, as shown by the fact that after one year of natural ageing at room temperature the adhesion and firmness values of the pressure-sensitive adhesive coating remained unchanged.

Increasing the plasticizers in the above film to a final formula of 100:30:20 yielded a composition which, in the form of 4 mil film, was found to be somewhat weak. However, this composition produced a reasonably satisfactory backing in thicknesses of about twelve mils. Pressure-sensitive adhesives coated on this backing were found to soften to a very slight extent after prolonged ageing in the final tape rolls, but the tape remained fully satisfactory for such uses as the binding of wire harnesses and the like.

On the other hand, films prepared from the above ingredients in the proportions 100:26.5:6.7, primed, and coated with adhesive, were found to be too tough and inelastic for most uses, even though the adhesive coating remained tacky and in good condition. When such films were elongated to more than approximately ten or twenty per cent of their initial length, they were found to acquire a permanent set and would not then retract to their original length. A slight increase in the proportion of dioctyl phthalate, for example, to about eight or ten parts, improved the films in this respect. On the other hand, adhesives coated on films plasticized with from 40 to 70 parts of "Paraplex G–25" and in the absence of the dioctyl phthalate were soon found to become deficient in tackiness.

Example 2

The plasticized vinyl polymer film of Example 1 was primed with a synthetic rubber-resin primer composition applied from solution in organic solvent, and coated with a natural rubber base pressure-sensitive adhesive. The resulting transparent pressure-sensitive adhesive tape was useful for wrapping splices in electrical conductors and for other purposes. The adhesive and backing were found to be in permanent equilibrium. The transparent nature of the tape was advantageous where it was desirable periodically to inspect the protected surface.

The composition used as the primer in this example consisted of a solution, in a mixture of 100 parts toluol and 20 parts methyl ethyl ketone, of 20 parts of a pure hydrocarbon thermoplastic terpene resin having a melting point of 115° F. and a zero acid number, and 25 parts of a rubbery butadiene-acrylonitrile copolymer.

The transparent pressure-sensitive adhesive was prepared by blending 288 lbs. of latex crepe rubber, 175 lbs. of the thermoplastic terpene resin having a melting point of 115° F., 2.88 lbs. of tetramethyl thiuram disulfide, and 3 lbs. of an antioxidant such as "Flectol H" (a condensation product of acetone and aniline melting at 120° C.), in solution in heptane containing a small amount of denatured alcohol as a viscosity reducing agent.

Example 3

Various pigments and colors may be added both to the backing and to the adhesive formulation of my insulating composition in order to improve the appearance, or to provide a distinctive color, or for other purposes. Heavy pigment loading of the vinyl film for example is found to improve the heat resistance.

A film twelve mils in thickness was prepared from a mixture of 700 parts "Vinylite VYNS," 200 parts "Paraplex G–25," 100 parts dioctyl phthalate, 1100 parts titanium dioxide pigment, and 30 parts calcium stearate, together with 100 parts of a mold inhibiting agent such as "Shirlan Extra" (salicyl anilide). The film was primed with the primer of Example 2 and coated with a polyacrylate base pressure-sensitive adhesive. The adhesive was composed of a copolymer of 75 parts of 2-ethylbutyl acrylate and 25 parts ethyl acrylate, tackified with a thermoplastic terpene resin, and firmed up by heating with small admixed amounts of zinc resinate and an oil soluble heat-reactive phenol-formaldehyde resin. Titanium dioxide was included as a pigment to produce a white adhesive. The produce was cut into narrow widths and wound into roll form, in this case with a varnished cambric interliner.

Samples of the tape showed approximately 100% strength at break, and had a tensile strength at break of approximately 30 lbs. per inch width. Retraction to original length from 20% elongation was complete in somewhat under five minutes, and from 50% elongation in approximately twenty-four hours.

Example 4

To produce a completely flame-resistant tape product, the primed film of Example 3 was coated with a pressure-sensitive adhesive consisting essentially of polymerized chloroprene and chlorinated diphenyl in approximately equal proportions by weight. The adhesive was applied from solution in a high aromatic content hydrocarbon solvent.

Example 5

To the film composition of Example 1 was added five parts of carbon black. The resulting film had a black glossy appearance and considerably increased tensile strength. The elasticity was somewhat reduced, but the film retracted to its original dimension from approximately 50% elongation in somewhat less than twenty-four hours.

The film was primed with the primer of Example 2 and coated with an adhesive consisting of 100 parts of a mixture of equal parts of natural rubber and Buna-S synthetic rubber, 50 parts of zinc oxide, 5 parts of carbon black, and 50 parts of heat treated wood rosin. A small amount of Flectol H antioxidant was also added, and the material was dispersed in heptane to a coatable viscosity. The resulting tape product was particularly applicable to the covering of splices in copper wires carrying an insulating coating of black pigmented plasticized synthetic polymer.

Having described various embodiments of our invention, for purposes of illustration rather than limitation, what we claim is as follows:

1. A pressure-sensitive adhesive insulating tape wound upon itself in roll form and comprised of: a stretchable and elastic film backing having a thickness of 4 to 20 mils and formed of a homogeneous mixture primarily consisting of a stable blend of a film-forming polymer of monomers including at least a major proportion of vinyl chloride, a substantially non-volatile liquid phthalyl ester plasticizer amounting to 8 to 20 parts per 100 parts of said polymer, and a soft and viscous low-acid-number alkyd plasticizer resin in amount at least equal to the amount of said liquid phthalyl ester plasticizer, the total amount of said plasticizers being about ⅓ to ½ the amount of said polymer and the proportions being such that the adhesive tape has the properties of stretch and elasticity hereafter

specified without causing pastiness or tack-loss of the contacting adhesive in the roll; and a eucohesive normally tacky and pressure-sensitive rubber-resin type adhesive coating united to the inner face of said film backing; said adhesive tape being unwindable without delamination or offsetting of adhesive, being originally stretchable by hand-pulling to an extent of at least 50% at room temperature and being substantially completely retractable from an elongation of 30% as herein specified.

2. An adhesive tape according to claim 1, wherein the adhesive includes a small proportion of an oil-soluble heat-reactive phenol-aldehyde resin.

3. An adhesive tape according to claim 1 in which the film forming polymer is a copolymer of vinyl chloride and a minor proportion of vinyl acetate, said copolymer having a softening temperature of at least about 280° C.

4. A pressure-sensitive adhesive insulating tape wound upon itself in roll form and comprised of: (1) a stretchable and elastic film backing having a thickness of 4 to 10 mils and formed of a homogeneous mixture primarily consisting of a stable blend of 70 parts of a copolymer of vinyl chloride and a minor proportion of vinyl acetate, about 10 parts of a substantially non-volatile liquid phthalyl ester plasticizer, and about 20 parts of a soft and viscous low-acid-number alkyd plasticizer resin; (2) an adhesive primer coating on the inside face of the film backing adapted to

increase the anchorage of the adhesive coating; and (3) a eucohesive normally tacky and pressure-sensitive rubber-resin type adhesive coating bonded to said primer coating; said adhesive tape being unwindable without delamination or offsetting of adhesive, being originally stretchable to an extent of at least 100% at room temperature and being substantially completely retractable from an elongation of 30% as herein specified.

5. An adhesive tape according to claim 4, wherein the adhesive includes a small proportion of an oil-soluble heat-reactive phenol-aldehyde resin.

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